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NOVON

Dubautia carrii and *D. hanaulaensis*, New Species of the Hawaiian Silversword Alliance (Compositae, Madiinae) from Moloka'i and Maui

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Abstract. *Dubautia carrii* B. G. Baldwin & Friar and *D. hanaulaensis* B. G. Baldwin are new species in *Dubautia* Gaudich. sect. *Railliardia* (Gaudich.) G. D. Carr (Compositae, Madiinae) of the Hawaiian silversword alliance that were previously treated within the circumscription of *D. linearis* (Gaudich.) D. D. Keck subsp. *opposita* (Sherff) G. D. Carr. The two species are allopatric, with *D. carrii* in mesic to wet shrubland and forest on eastern Moloka'i and *D. hanaulaensis* in mesic shrubland and forest on southern West Maui. Although closely resembling *D. linearis* subsp. *linearis* and *D. linearis* subsp. *hillebrandii* (H. Mann) G. D. Carr in habit and capitulescence characteristics, *D. carrii* and *D. hanaulaensis* differ from both subspecies of *D. linearis* in the sense adopted here by having consistently opposite (rather than variable) phyllotaxy and toothed (rather than entire) leaf apices, and by occurring in mesic or wet (rather than mostly dry) habitats. *Dubautia carrii* and *D. hanaulaensis* are highly similar morphologically; they commonly differ from one another in stature, stem vestiture, leaf shape, capitulescence size, and receptacular-bract glandulosity. Molecular phylogenetic data indicate that *D. carrii* is most closely related to the East Maui endemic species of *Dubautia* sect. *Railliardia* (i.e., *D. menziesii* (A. Gray) D. D. Keck, *D. platyphylla* (A. Gray) D. D. Keck, *D. reticulata* (Sherff) D. D. Keck, and *D. waianapanapaensis* G. D. Carr), and *D. hanaulaensis* represents an early-diverging lineage within the Maui Nui–Hawai'i (Big Island) clade of *Dubautia* sect. *Railliardia*. High similarity of *D. carrii* and *D. hanaulaensis* in morphology and ecology may reflect retained ancestral or plesiomorphic states shared with the common ancestor of the Maui Nui–Hawai'i clade of *Dubautia* sect. *Railliardia*, a lineage otherwise known for exceptional adaptive radiation.

Key words: Asteraceae, Compositae, *Dubautia*, Hawaiian Islands, IUCN Red List, Maui, Moloka'i, Madiinae, sect. *Railliardia*, silverswords, tarweeds.

Dubautia Gaudich. sect. *Railliardia* (Gaudich.) G. D. Carr is the only taxon in the endemic Hawaiian silversword alliance (*Argyroxiphium* DC., *Dubautia*, and *Wilkesia* A. Gray; Madiinae, Compositae) that occupies five of the six highest islands of the Hawaiian archipelago (O'ahu, Lana'i, Moloka'i, Maui, and Hawai'i) and is absent from the oldest, Kaua'i, where all other species of *Dubautia* outside section *Railliardia* and both species of *Wilkesia* are found, at least in part (Carr, 1985, 1999; Baldwin & Carr, 2005). Molecular phylogenetic studies indicate that the nine species included within *Dubautia* sect. *Railliardia* by Carr (1985) constitute a clade that postdates the onset of diversification of *Dubautia*–*Wilkesia* on Kaua'i, where the most recent common ancestor of all taxa in both genera likely occurred (Baldwin et al., 1990; Baldwin & Robichaux, 1995; Baldwin & Sanderson, 1998; Baldwin, in prep.). Those

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DNA findings are consistent with evidence from cytogenetic and enzyme-electrophoretic studies (Carr & Kyhos, 1981, 1986; Witter & Carr, 1988) for less divergence between species of *Dubautia* sect. *Railliardia* than between railliardias and most other species of *Dubautia* (and *Wilkesia*).

Molecular data indicate that *Dubautia* sect. *Railliardia* underwent diversification marked by minimal interisland dispersal and marked ecological radiation on O'ahu, East Maui, and Hawai'i (Baldwin & Robichaux, 1995; Baldwin, 1997; Friar et al., 2006). No diversification in *Dubautia* sect. *Railliardia* has been evident on West Maui, Moloka'i, or Lana'i, where only taxa that occur elsewhere in the archipelago have been documented (Carr, 1985).

Dubautia linearis (Gaudich.) D. D. Keck is one of only two species of *Dubautia* sect. *Railliardia* native to more than one island—the other is *D. scabra* (DC.) D. D. Keck; both species are known from three of the four major islands of Maui Nui (i.e., Maui, Moloka'i, and Lana'i) and from Hawai'i (Carr, 1985). Within *D. linearis*, Carr (1985) recognized three subspecies: *D. linearis* subsp. *linearis*, *D. linearis* subsp. *hillebrandii* (H. Mann) G. D. Carr (≡ *D. hillebrandei* (H. Mann) D. D. Keck, ≡ *Railliardia hillebrandii* H. Mann), and *D. linearis* subsp. *opposita* (Sherff) G. D. Carr (≡ *D. linearis* var. *opposita* (Sherff) D. D. Keck, ≡ *Railliardia linearis* var. *opposita* Sherff). Geographic distributions of the three subspecies of *D. linearis* sensu Carr (1985) are either distinct or contiguous, with *D. linearis* subsp. *hillebrandii* on Hawai'i, *D. linearis* subsp. *linearis* on (mostly East) Maui and Lana'i, and *D. linearis* subsp. *opposita* on eastern Moloka'i and West Maui. Populations of both *D. linearis* subsp. *linearis* and *D. linearis* subsp. *opposita* occur on West Maui; hybrids between the two taxa have not been reported (Carr, 1985, 2003).

Morphologically and ecologically, *Dubautia linearis* subsp. *opposita* is unlike the other two subspecies in some prominent characters. Leaves are uniformly opposite and with one to four pairs of marginal teeth in *D. linearis* subsp. *opposita* as opposed to variable in phyllotaxy on a single plant (alternate, opposite, and/or whorled) and usually entire in the other two subspecies. Populations of *D. linearis* subsp. *opposita* generally occur in mesic or wet settings (forest or shrubland) rather than dry shrubland, where most populations of the other two subspecies are found.

Molecular phylogenetic analyses of 18S–26S nuclear ribosomal DNA (rDNA) ITS and ETS sequences indicate that Moloka'i populations of *Dubautia linearis* subsp. *opposita* belong to a clade with all members of *Dubautia* sect. *Railliardia* that are endemic to East Maui (i.e., *D. menziesii* (A. Gray) D. D. Keck, *D. platyphylla* (A. Gray) D. D. Keck, *D. reticulata* (Sherff) D. D. Keck, and *D. waianapanapaensis* G. D. Carr) to the exclusion of sampled populations of *D. linearis* subsp. *linearis* from Lana'i, East Maui, and West Maui and *D. linearis* subsp. *hillebrandii* from dry and wet habitats on Hawai'i, which, in turn, are evidently closely related to one another and to other species of *Dubautia* sect. *Railliardia* that occur at least in part on Hawai'i, e.g., *D. arborea* (A. Gray) D. D. Keck and *D. ciliolata* (DC.) D. D. Keck (Baldwin, in prep.; Fig. 1). In light of the inability to reject rate-constant evolution of ITS sequences in the silversword alliance (Baldwin & Sanderson, 1998), lack of molecular divergence between *D. linearis* subsp. *opposita* from Moloka'i and the four endemic East Maui species indicates that *D. linearis* subsp. *opposita* and the East Maui endemics diverged from a common ancestor less than 1 million years ago (Ma), in accord with the origin of East Maui (Haleakala) ca. 0.75–1.1 Ma (Carson & Clague, 1995; Clague, 1996). The above evidence for a closer relationship of *D. linearis* subsp. *opposita* to the East Maui endemics than to typical *D. linearis* leads us to conclude that *D. linearis* subsp. *opposita* from Moloka'i should be treated as a distinct species.

1. Dubautia carrii B. G. Baldwin & Friar, sp. nov. TYPE: U.S.A. Hawai'i: Moloka'i, southeasterly slopes of Pu'u o Ka'eha, 21°06′49″N, 156°54′57″W, ca. 1100 m elevation, 19 Sep. 2007, *B. G. Baldwin & S. J. Bainbridge 1497* (holotype, PTBG; isotypes, BISH, MO, UC, US). Figure 2.

Railliardia linearis Gaudich. var. *opposita* Sherff, Amer. J. Bot. 20: 619. 1933, as "*Raillardia*," syn. nov. *Dubautia linearis* (Gaudich.) D. D. Keck var. *opposita* (Sherff) D. D. Keck, Occas. Pap. Bishop Mus. 11(19): 28. 1936. *Dubautia linearis* subsp. *opposita* (Sherff) G. D. Carr, Allertonia 4: 97. 1985. TYPE: U.S.A. Hawai'i: Moloka'i, Maunahui Gulch, 21 Mar. 1910, *J. F. Rock 6126* (holotype, GH; isotypes, BISH, GH).

A congeneris *Dubautiae* Gaudich. sect. *Railliardiae* (Gaudich.) G. D. Carr differt characteribus conjunctis: fruticibus 2–30 dm altis, caulibus vegetativis sparsim vel modice hispidulis vel glabratis, foliis oppositis, anguste vel late ellipticis vel elliptico-lanceolatis vel elliptico-oblanceolatis, interdum glabris, plerumque saltem abaxialiter sparsim et minute glandulosis, interdum adaxialiter hispidulis in costa proximali, distaliter 1 ad 3 (vel 4)-dentatis in quoque latere, dentibus brevibus, laminis parallelodromis, 3- vel 5-nerviis, capitulis 20 ad 150+ in capitulescentiis glomerulatis vel paniculiformis vel corymbiformis 2–17 × 2–10 cm, pseudoinvolucris modice ad dense sessili-glandulosis et stipitato-glandulosis, interdum cum pilis non glandulosis, flosculis 2 ad 5.

Shrubs, compact to often diffusely branched, 2–30 (commonly ≥ 15) dm tall, vegetative stems brown to dark purple, sparsely or moderately hispidulous to

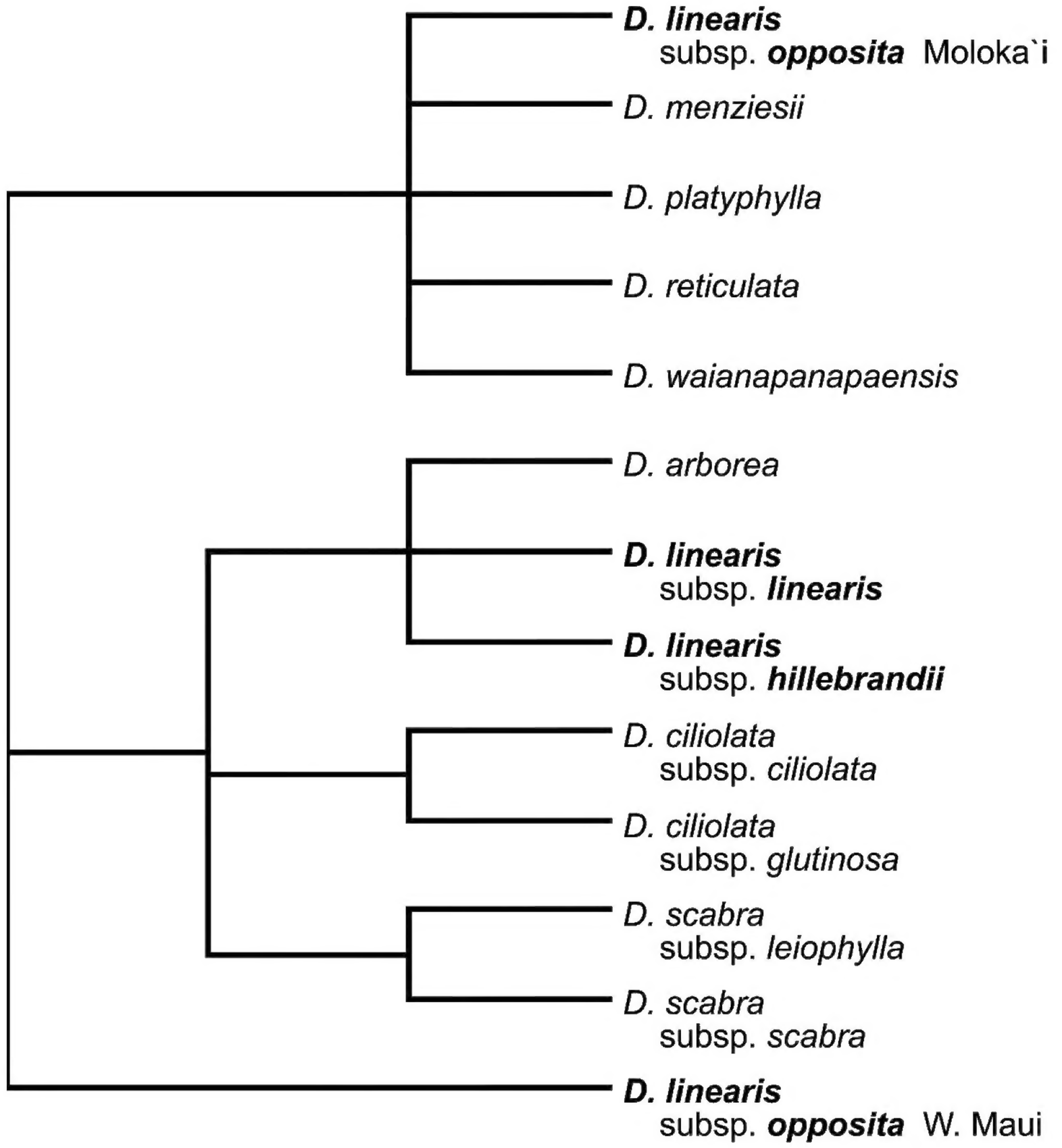

Figure 1. Summary of phylogenetic relationships in the Maui Nui–Hawai'i clade of *Dubautia* sect. *Railliardia* based on maximum-likelihood analysis of nuclear ribosomal DNA ITS and ETS (Baldwin, in prep.). Representatives of *D. linearis* sensu Carr (1985) are presented in boldface. Branch lengths are not scaled. Note: The tree position of *D. scabra* shown here reflects only part of its evident hybrid ancestry (Friar et al., 2008). Authorities for taxa not discussed in the text: *D. ciliolata* subsp. *glutinosa* G. D. Carr.

glabrate, leaf scars moderately ciliolate on distal border to glabrate, flowering stems densely hirtellous and densely sessile- and stipitate-glandular. Leaves opposite, sessile, 13–100 × 4–14 mm, narrowly to broadly elliptic, elliptic-lanceolate, or elliptic-oblanceolate, bases clasping ≤ half of stem, faces glabrous or usually sparsely and minutely glandular, at least abaxially, sometimes hispidulous along proximal midvein adaxially, margins 1- to 3(4)-toothed on each side distally, teeth short (the bracts of capitulescence entire), margins sometimes sparsely ciliate or glandular near base, apices acute to mucronulate, blades parallelodromous, 3- or 5-nerved. Heads discoid, 20 to 150+, in dense to open, rounded to pyramidal, glomerulate to paniculiform or corymbiform arrays, 2–17 × 2–10 cm, internodes to 30 mm, peduncles densely hirtellous and densely sessile- and stipitate-glandular, 0–7 mm; receptacles ± flat, setulose, epaleate except for pseudophyllaries, false involucre cylindric to narrowly funnelform, pseudophyllaries (receptacular bracts) 2 to 5, uniseriate, green, linear to usually ± oblanceolate, 5–6 mm, connate 2/3–4/5 their lengths proximally, apices white-ciliate, abaxial faces moderately to densely sessile- and stipitate-glandular, sometimes with scattered nonglandular hairs; florets 2 to 5, corollas exserted, yellow to orange-yellow, 3.5–5 mm, ± equal to or exceeding pappi by up to 1 mm, tubes cylindrical, ± equaling throats, 0.3–0.5 mm diam., sometimes abruptly flared at bases, glabrous, throats narrowly funnelform to campanulate, 1–1.5 mm diam. at apices, glabrous, lobes ± triangular, often reflexed, 0.6–1 mm, abaxially setulose; anthers reddish, often drying brownish. Cypselae black, straight, ± clavate, 3–4.5 mm, ± terete or 3- to 4-angled, sparsely and irregularly hispidulous to glabrate; pappi of 16 to 26, tawny or reddish brown, subequal, plumose, setiform scales 3–4.5 mm, marginal setae of scales to 0.75 mm.

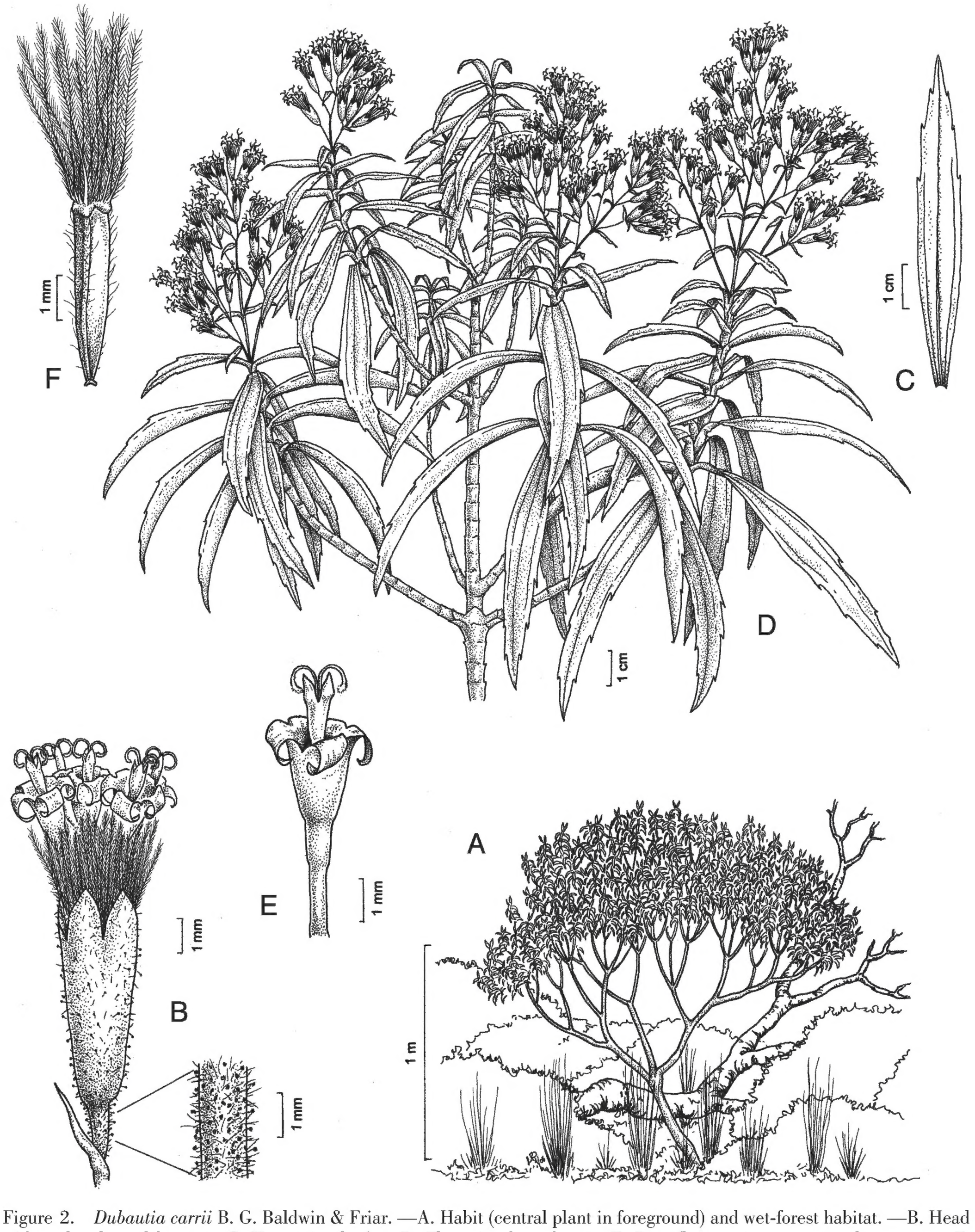

Figure 2. *Dubautia carrii* B. G. Baldwin & Friar. —A. Habit (central plant in foreground) and wet-forest habitat. —B. Head with peduncle and bract. —C. Vegetative leaf. —D. Flowering branches. —E. Disc floret, minus ovary and pappus. —F. Cypsela with pappus.

Distribution and habitat. *Dubautia carrii* is known only from eastern Moloka'i, in mesic to wet forest or shrubland within an elevational range of 450–1150 m. Native angiosperm associates include species of *Metrosideros* Banks ex Gaertn., *Leptecophylla* C. M. Weiller, *Dodonaea* Mill., *Vaccinium* L., *Psychotria* L., *Xylosma* G. Forst., *Wikstroemia* Endl., *Santalum* L., *Dianella* Lam. ex Juss., *Pipturus* Wedd., *Coprosma* J. R. Forst. & G. Forst., *Kadua* Cham. & Schltdl., *Cocculus* DC., *Diospyros* L., *Urera* Gaudich., *Syzygium* Gaertn., *Myrsine* L., *Ilex* L., *Pleomele* Salisb., *Nestegis* Raf., *Pittosporum* Banks ex

Gaertn., *Tetraplasandra* A. Gray, *Chamaesyce* Gray, *Lysimachia* L., *Viola* L., *Scaevola* L., *Cyrtandra* J. R. Forst. & G. Forst., and *Boehmeria* Jacq. Associated ferns include species of *Dicranopteris* Bernh., *Sadleria* Kaulf., *Cibotium* Kaulf., *Diplopterygium* (Diels) Nakai, and *Lepisorus* (Sm.) Ching. Alien trees (e.g., species of *Casuarina* L., *Callitropsis* Oerst., *Eucalyptus* L'Hér., *Pinus* L., and *Fraxinus* L.), shrubs (e.g., *Lantana camara* L.), and grasses (e.g., *Melinis minutiflora* P. Beauv. and *Andropogon virginicus* L.) are well established in portions of the range. Natural hybrids have been documented between *D. carrii* and *D. plantaginea* Gaudich. subsp. *plantaginea* (*B. G. Baldwin 1217*, UC) and between *D. carrii* and *D. scabra* subsp. *leiophylla* (A. Gray) G. D. Carr (= *D. molokaiensis* (Hillebr.) D. D. Keck) (Carr, 1985).

Phenology. Most flowering specimens of *Dubautia carrii* have been collected from September to November.

Etymology. *Dubautia carrii* is named for Gerald D. ("Gerry") Carr, Professor Emeritus of Botany at the University of Hawai'i, Honolulu, who has contributed immensely to the understanding of the evolution, natural history, cytogenetics, diversity, and origin of the Hawaiian silversword alliance through decades of systematic research. Gerry's efforts laid the foundation for current evolutionary efforts in the silversword alliance, and his generosity of spirit and appreciation of colleagues helped to promote camaraderie among silversword-alliance researchers.

Taxonomic note. The epithet from *Railliardia linearis* var. *opposita* could have been used in a new combination for the species here called *Dubautia carrii*. But, because the circumscription of *D. carrii* is considerably narrower than that of Carr's (1985) taxon *D. linearis* subsp. *opposita* (≡ *R. linearis* var. *opposita*), we have chosen to adopt a new epithet and a new type for the present taxon at species rank (following Art. 11.2 of the *International Code of Botanical Nomenclature* [McNeill et al., 2006]) to better reflect the differences in circumscription between the present species and Carr's (1985) subspecies, and to forestall taxonomic confusion.

Paratypes. U.S.A. **Hawai'i:** Moloka'i, Central Moloka'i (914 m elev.), *A. S. Hitchcock 15167* (BISH, US); Kawela trail, *L. M. Cranwell 3521* (BISH); Kawela, Pu'u o Ka'eha, 8 June 1955, *M. F. Landraf s.n.* (BISH, US); W of Pu'u o Ka'eha along Center Ridge Rd., *B. G. Baldwin & S. J. Bainbridge 1495* (BISH, MO, PTBG, UC, US); ridge betw. W & E fork of Kawela Gulch, *F. R. Warshauer 2331 & P. H. McEldowney* (BISH); E Kawela Gulch, *C. Russell 704* (BISH); W fork of stream just E of Kawela Ridge, *D. H. Lorence 5637 with C. Russell, S. Perlman, C. Imada, J. Lau, P. Higashino & E. Pawn* (BISH); Kumu'eli Gulch, *S. Perlman 18260* (US); ridge betw. Kapa'ia and Kaunakakai gulches, *J. Davis 881* (BISH); Makakupa'ia, *O. Degener, I. Degener & N. Pekelo Jr. 27561* (BISH), *D. Herbst & G. Spence 5112* (BISH); Moloka'i Forest Reserve Rd., ca. 0.2 km W of Makakupa'ia Rd. jct., *B. G. Baldwin & S. J. Bainbridge 1389* (UC), *1496c* (BISH, MO, PTBG, UC, US); Pu'u Kolekole, 2 Feb. 1981, *W. Gagné s.n.* (HAW), *L. W. Cuddihy 1131* (BISH), *S. Perlman 6651* (BISH [2], US), *B. G. Baldwin & S. J. Bainbridge 1390* (UC), *1496a* (BISH, MO, PTBG, UC, US); ridge S of Pu'u Kolekole, *R. L. Stemmermann 3869 & S. Montgomery* (BISH), *M. F. McGlaughlin 060 with V. Soza* (BISH); Sandalwood Pit, 24 Oct. 1976, *W. Char s.n.* (HAW), *G. Carr, W. Char, G. Linney & J. Aidem 1048* (BISH, US), *G. K. Linney 5043* (BISH); Waikolu Lookout, 24 Oct. 1976, *W. Char s.n.* (HAW), *G. Carr, W. Char, G. Linney & J. Aidem 1049* (BISH, US), 5 July 1984, *E. Misaki s.n.* (BISH), *B. G. Baldwin & S. J. Bainbridge 1215, 1267a* (UC); near edge of Waikolu Valley, *N. Krauss 4* (BISH); head and E rim of Waikolu Valley, 18 June 1962, *Y. & K. Kondo s.n.* (BISH); Waikolu Valley head, *Y. Kondo, P. Kirsch & H. Spoehr 58.12a* (BISH); W head of Waikolu Valley, *O. Degener & I. Degener 23741* (BISH), *23742* (BISH, US).

Carr (1985: 97) included strictly opposite-leaved plants from (southern) West Maui within the circumscription of *Dubautia linearis* subsp. *opposita*, but noted that such plants are "...somewhat morphologically and ecologically intermediate between material from East Maui and Molokai" (i.e., between *D. carrii* and *D. linearis* subsp. *linearis*). In comparison with *D. carrii*, the West Maui plants in question are shrubs of commonly smaller stature, with usually glabrous (as opposed to at least somewhat hispidulous) vegetative stems, mostly narrower leaves, generally fewer-headed, more congested capitulescences, and less prominently glandular false-involucres. Molecular phylogenetic analyses of ITS and ETS sequences indicate that the West Maui plants constitute an early diverging lineage within the clade that includes taxa of *Dubautia* sect. *Railliardia* from Maui Nui and Hawai'i; the Moloka'i and West Maui populations previously assigned to *D. linearis* subsp. *opposita* do not appear to represent a monophyletic group (Baldwin, in prep.; Fig. 1). Based on morphological, ecological, and molecular phylogenetic considerations, the West Maui plants are recognized here as a new species.

2. Dubautia hanaulaensis B. G. Baldwin, sp. nov. TYPE: U.S.A. Hawai'i: West Maui, S of Hana'ula, rim of Ukumehame, 1070 m, 25 Aug. 1991, *K. R. Wood 1177 with S. Perlman* (holotype, PTBG; isotype, US). Figure 3.

Haec species a *Dubautia carrii* B. G. Baldwin & Friar habitu fruticis 2–10(–15) dm alti, caulibus vegetativis plerumque glabris, foliis linearibus usque anguste oblanceolatis vel elliptico-oblanceolatis sine trichomatibus eglandulosis, capitulis plerumque 7 ad 45+ in capitulescentiam 2–8.5+ × 2–7 cm dispositis atque pseudoinvolucro sparsim vel parce glanduloso glandibus minutis ± sessilibus differt.

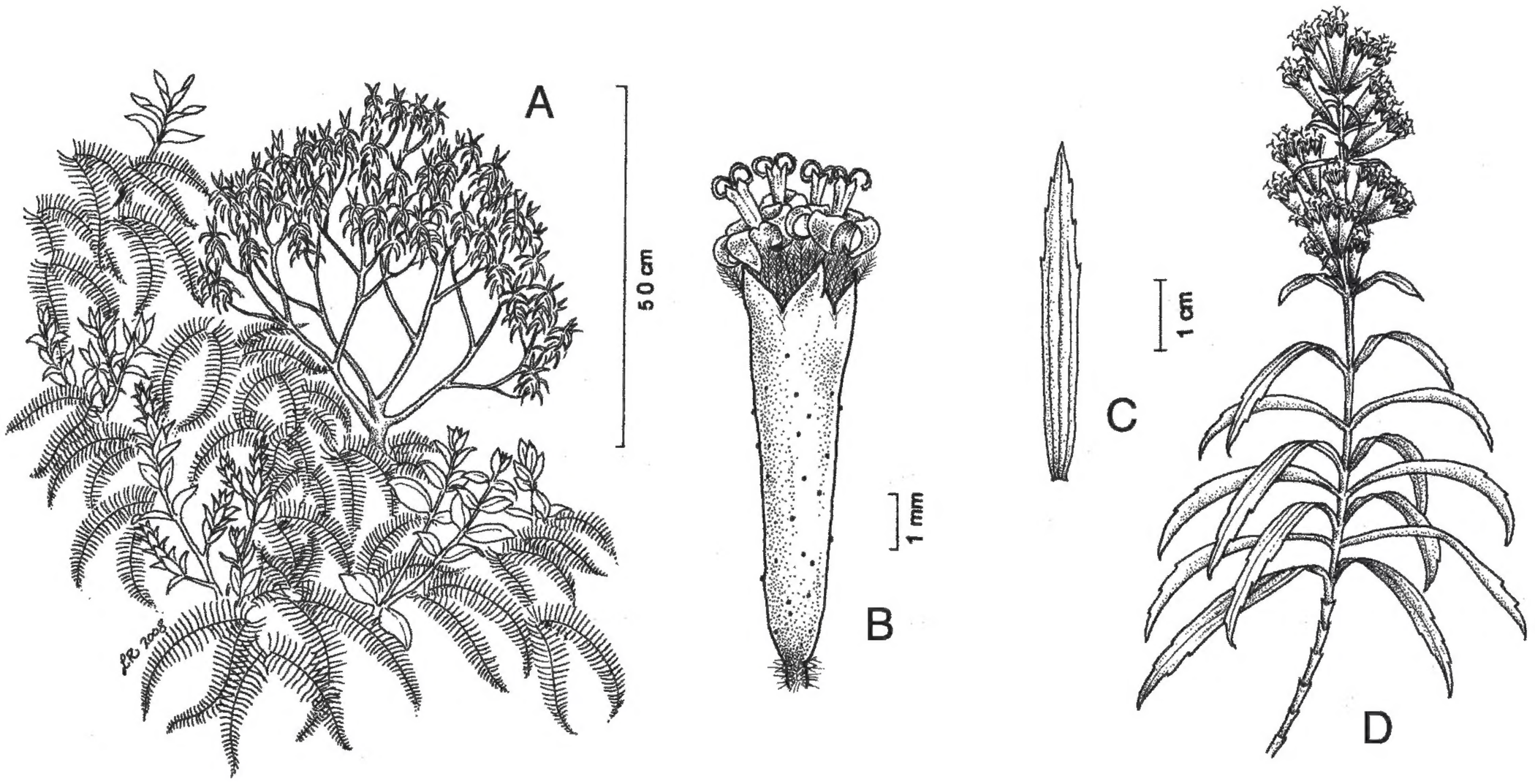

Figure 3. *Dubautia hanaulaensis* B. G. Baldwin. —A. Habit (plant in upper right) and mesic-shrubland habitat. —B. Head. —C. Vegetative leaf. —D. Flowering branch.

Shrubs, often compact, much-branched, 2–10(–15) dm tall, vegetative stems brown to black, usually glabrous, sometimes irregularly hispidulous or minutely glandular, leaf scars moderately or sparsely ciliolate on distal borders to glabrate, flowering stems hirsutulous and sessile- to stipitate-glandular. Leaves opposite, sessile, 15–60 × 3–10 mm, linear to narrowly oblanceolate or elliptic-oblanceolate, bases clasping ≤ half of stem, margins 1- to 4-toothed on each side distally, teeth short (the bracts of capitulescence entire), eciliolate, often with marginal sessile glands near bases, apices acute or mucronulate, faces usually minutely glandular near base adaxially, otherwise glabrous or inconspicuously and sparsely glandular, rarely glabrous throughout, blades parallelodromous, 3- or 5-nerved. Heads discoid, 7 to 45+, in dense to open, rounded to pyramidal, glomerulate to paniculiform arrays, 2–8.5+ × 2–7 cm, internodes to 12 mm, peduncles densely hirtellous and densely sessile- and stipitate-glandular, peduncles 0–8 mm; receptacles ± flat, setulose, epaleate except for pseudophyllaries, false involucres cylindric to narrowly funnelform, pseudophyllaries (receptacular bracts) 4 to 6, uniseriate, green, linear to usually ± oblanceolate, 5–7 mm, connate 2/3–7/8 their lengths proximally, apices white-ciliate, abaxial faces sparsely to moderately minutely glandular, glands mostly or all sessile, sometimes also with scattered nonglandular hairs; florets 4 to 6, corollas exserted, yellow to orange-yellow, 3.5–5 mm, ± equal to or exceeding pappi to 1 mm, tubes cylindrical, 0.5–1× longer than throat, 0.3–0.5 mm diam., often flared at bases, glabrous, throats goblet-shaped to narrowly funnelform or campanulate, 1–1.5 mm diam. distally, glabrous, lobes ± triangular, often reflexed, 0.6–1 mm, abaxially setulose or glabrous; anthers reddish, often drying brownish. Cypselae black, straight, ± clavate, 2.5–4 mm, ± terete or 3- to 4-angled, sparsely or moderately hispidulous to glabrate; pappi of 15 to 23, tawny, subequal, plumose, setiform scales 3.5–4 mm, marginal setae of scales to 1 mm.

Distribution and habitat. *Dubautia hanaulaensis* is known only from southern West Maui, in mesic shrubland and forest within an elevational range of 850–1100 m. Native angiosperm associates include species of *Metrosideros*, *Leptecophylla*, *Dodonaea*, *Vaccinium*, *Wikstroemia*, *Lysimachia*, *Bidens* L., *Diospyros*, *Xylosma*, *Nestegis*, *Myrsine*, *Melicope* J. R. Forst. & G. Forst., *Cocculus*, *Schiedea* Cham. & Schltdl., *Lobelia* L., *Pseudognaphalium* Kirp., *Remya* Hillebr. ex Benth. & Hook., *Dianella*, *Pleomele*, *Carex* L., and *Morelotia* Gaudich. Associated ferns include species of *Dicranopteris*, *Sadleria*, *Dryopteris* Adans., *Elaphoglossum* Schott ex J. Sm., *Pteridium* Gled. ex Scop., *Sphenomeris* Maxon, *Nephrolepis* Schott, and *Asplenium* L. Alien species of *Lantana* L., *Schinus* L., *Triumfetta* L., *Erigeron* L., *Andropogon* L., *Melinis* P. Beauv., *Ageratina* Spach, *Adiantum* L., and *Blechnum* L. are naturalized within the habitat. No natural hybrids are known between *D. hanaulaensis* and any of the other four taxa of *Dubautia* that occur in southern West Maui, i.e., *D. linearis* subsp. *linearis*, *D. laxa* Hook. & Arn. subsp. *laxa*, *D. plantaginea* subsp. *plantaginea*, and *D. scabra* subsp. *leiophylla*.

Phenology. Most flowering specimens of *Dubautia hanaulaensis* have been collected from August to November.

Etymology. The species name, *Dubautia hanaulaensis*, reflects the occurrence of all known populations in the vicinity (downslope) of Hana'ula, the highest summit (1407 m in elevation) in the southern West Maui Mountains.

Paratypes. U.S.A. **Hawai'i:** West Maui, Wailuku Distr., Mauka of (above) McGregor, *O. Degener 22,084* (F), SW rim of Pohakea Gulch, *G. Carr, D. Kyhos, M. Witter & R. Hobdy 1132* (BISH, F, HAW, US), *1136* (BISH, US); Pohakea Gulch, *H. Oppenheimer, K. Wood & C. Brosius H100504* (UC), *H. Oppenheimer 100704 with S. Perlman* (UC), *B. Baldwin & H. Oppenheimer 1502* (UC), *1503* (UC), *1504* (UC); Kaonohua Gulch, *H. Oppenheimer & C. Brosius H120513* (UC); border of Lahaina & Wailuku districts, Manawainui Gulch, near Polanui, *K. Wood 1161 with S. Perlman* (PTBG); S of Hana'ula, rim of Ukumehame, *K. Wood 1178 with S. Perlman* (PTBG).

Evolutionary significance. Extensive phenotypic similarities between *Dubautia carrii* and *D. hanaulaensis* are likely the result of retained ancestral or plesiomorphic traits that were present in their most recent common ancestor, which, based on the rDNA trees (Fig. 1), was also the common ancestor of the four East Maui endemics (*D. menziesii*, *D. platyphylla*, *D. reticulata*, and *D. waianapanapaensis*) and perhaps the entire Maui Nui–Hawai'i clade of *Dubautia* sect. *Railliardia* (Baldwin, in prep.), notwithstanding the inferred contribution of a lineage outside the group to the hybrid ancestry of one of the species, *D. scabra* (see Friar et al., 2008). Restriction of both *D. carrii* and *D. hanaulaensis* to the oldest volcanoes occupied by the Maui Nui–Hawai'i clade (Carr, 1985; Carson & Clague, 1995) is consistent with the hypothesis of retained ancestral phenotypic traits in the two species. From that perspective, *D. carrii* and *D. hanaulaensis* may offer particularly valuable insights concerning ancestral characteristics of a clade that has undergone spectacular adaptive radiation on Maui Nui and Hawai'i.

IUCN Red List categories. *Dubautia carrii* and *D. hanaulaensis* are each endemic to a single volcano and are vulnerable to displacement by introduced plants and destruction by ungulates. Occurrence of apparently healthy populations of *D. carrii* within a unit of the Pu'u Ali'i Natural Area Reserve (state of Hawai'i) fenced by the state of Hawai'i and the National Park Service on Moloka'i (H. Oppenheimer, pers. comm.) and within the Kamakou Preserve of The Nature Conservancy offers the best hope for survival of the species, with continuing weed and pig control. Ungulate exclusion and eradication from Pohakea Gulch and other nearby habitat of *D. hanaulaensis* in the Hana'ula area of West Maui by the state of Hawai'i, West Maui Mountains Watershed Partnership, and Wailuku Water Company and weed control there by the Maui Invasive Species Committee have helped to prevent decimation of the species. Even in the absence of ungulates, continuing control of invasive plants will likely remain necessary to prevent decline of both species. Based on the criteria of the International Union for Conservation of Nature and Natural Resources (IUCN, 2001) for assessing categories of extinction risk, *D. carrii* should be considered Vulnerable (VU) and *D. hanaulaensis* should be considered Endangered (EN).

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Douglasia conservatorum (Primulaceae), a New Species from Idaho and Montana, U.S.A.

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Abstract. *Douglasia conservatorum* Björk is described as a new species from a single population in the Coeur d'Alene Mountains along the Idaho/Montana border in the United States. With other members of the genus, it shares a pink corolla color, branched and stellate trichomes, and pulvinate habit. Within *Douglasia* Lindl., it is unique in possessing papillae on the leaves, and additionally differs in its combination of traits of leaf shape, flower number, shape of the involucre bracts, and distribution and morphology of trichomes. Its morphology and range suggest that it is related to other temperate-climate *Douglasia* species, in contrast to all species in the northern, (sub)Arctic center of diversity. A key to *Douglasia* is presented. Like all other members of the genus, *D. conservatorum* is endemic to a small geographic range. The ecology and conservation priority of the species are discussed.

Key words: Coeur d'Alene Mountains, *Douglasia*, Idaho, IUCN Red List, Montana, Primulaceae.

Two regions are home to most of the diversity in the genus *Douglasia* Lindl. (Primulaceae): a northern center in the Beringian region of far northwestern North America and a southern center in the northwestern contiguous United States and adjacent southwestern Canada. The intervening latitudinal gap between these two centers of *Douglasia* species diversity corresponds to the extent of the ice sheets during the Last Glacial Maximum, where the genus is nearly absent, suggesting that species of *Douglasia* do not disperse rapidly into new geographic territory. Indeed, all of the species are regionally or narrowly endemic, restricted to small global ranges (Constance, 1938; Kelso, 1992). The southern center of *Douglasia* diversity includes five taxa, *D. idahoensis* Douglass M. Hend., *D. laevigata* A. Gray var. *ciliata* Constance, *D. laevigata* var. *laevigata*, *D. montana* A. Gray, and *D. nivalis* Lindl.

Plants of a population of *Douglasia* found on Bloom Peak in the Coeur d'Alene Mountains on the Idaho/Montana border do not match the morphological identity of any of these five taxa, and are segregated from them by approximately 200 km. The plants also do not correspond to the morphologies of the Beringian species (*D. alaskana* (Coville & Standl. ex Hultén) S. Kelso, *D. arctica* Hook., *D. beringensis* S. Kelso, Jurtzev & D. F. Murray, *D. gormanii* Constance, and *D. ochotensis* (Roem. & Schult.) Hultén) and are yet further separated from these geographically (Kelso, 2009). The morphological and geographic isolation of this population within *Douglasia* prompted investigation into the taxonomic validity of the plants as a new species.

Douglasia conservatorum Björk, sp. nov. TYPE: U.S.A. Idaho: Shoshone Co., Coeur d'Alene Natl. Forest, Bitterroot Mtns., Bloom Peak on Idaho/Montana border, NE of Pritchard, T51N, R5E, NW Sect. 21, slope 70%, aspect N/NE, 5800 ft., subalpine forb community dominated by *Juncus* sp., 8 July 1997, *A. Sondenaa 379* (holotype, ID). Figure 1.

Haec species a congeneris habitu suffruticoso, foliis viridubus papillosis atque pedunculo trichomatibus stellatis dense vestito flores plerumque 3 ad 6 gerente distinguitur.

A loosely pulvinate subshrub 5–20 cm wide, with a taproot topped by a branched caudex; leaf rosettes with 14 to 22 leaves. Leaves linear to narrowly elliptic, 7–16.5 × 1.3–2.6(–2.9) mm, fleshy but not distinctly succulent, margins sometimes obscurely (rarely distinctly) dentate in upper half, blades green and papillate on the margins and laminae; marginal papillae ca. 1.5–2× longer than wide, spinulose (Fig. 2). Peduncles 1 per leaf rosette, 12–30 mm tall, stellate-hairy throughout, the trichomes producing a grayish color; inflorescence terminal, umbelloid, 1 per scape, bearing broadly lanceolate to ovate or broadly elliptic bracts 2.7–5.1 × 1.1–3 mm, acute to obtuse at apex; pedicels (2)3 to 6(to 10), densely stellate, 3.5–8(–27) mm, each bearing a single bractless flower. Calyces sparsely to densely stellate- or branched-hairy, 5.5–9 × 3–6 mm (width measured across apex of connate portion in pressed material), with narrowly to broadly triangular teeth, 2.8–5 × 1–2.5 mm; corolla uniformly deep pink with yellow markings at the throat; corolla tube 10–11.5 mm long in total, with a limb 5.2–5.6 mm long; corolla lobes obovate to cuneate, often erose across the rounded, truncate, or (seldom) emarginate apex; corolla persistent after

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Figure 1. —A. Habit of *Douglasia conservatorum* Björk showing the grayish stellate peduncles. —B. Corollas. —C. Habitat at the type locality of *D. conservatorum* showing the ridgeline habitat shortly above the snow cornices. Photos by the author.

shriveling, covering the globose fruits. Fruits dry prior to dehiscence, splitting open by 5 valves; seeds laterally flattened, medium reddish brown, with a pitted-reticular outer coat (Fig. 3).

Habitat and distribution. Douglasia conservatorum grows in open subalpine vegetation on well-drained gravelly soils derived from Precambrian siltite (Harrison et al., 2000). All plants occur along the length of a windblown ridge-crest. Its micro-distribution suggests that it is ecologically limited by duration or depth of snow accumulation. Snow blows from the ridge into cornices located slightly downslope to the leeward of the prevailing winds. No plants of *D. conservatorum* were located within this cornice zone, nor downslope on the windward side of the ridge, where snow accumulation is also very deep. Associated species include *Arabis nuttallii* (Kuntze) B. L. Rob., *Calochortus apiculatus* Baker, *Carex geyeri* Boott, *C. rossii* Boott in Hook., *Eremogone capillaris* (Poir.) Fenzl var. *americana* (Maguire) R. L. Hartm. & Rabeler, *Eriogonum flavum* Nutt. var. *piperi* (Greene) M. E. Jones, *Heuchera cylindrica* Douglas ex Hook., *Lomatium sandbergii* (J. M. Coult. & Rose) J. M. Coult. & Rose, *Polytrichum* Hedw., *Penstemon albertinus* Greene, and *Vaccinium oreophilum* Rydb.

Douglasia conservatorum is known only from the type locality, on Bloom Peak, on the Idaho/Montana border. Its narrow geographic range follows suit with other members of the genus, all of which are regional or narrow endemics of northwestern North America and Beringian Russia. Fruitless searches in 2003–2006 for *D. conservatorum* were undertaken on nearby peaks in the Coeur d'Alene Mountains. The late

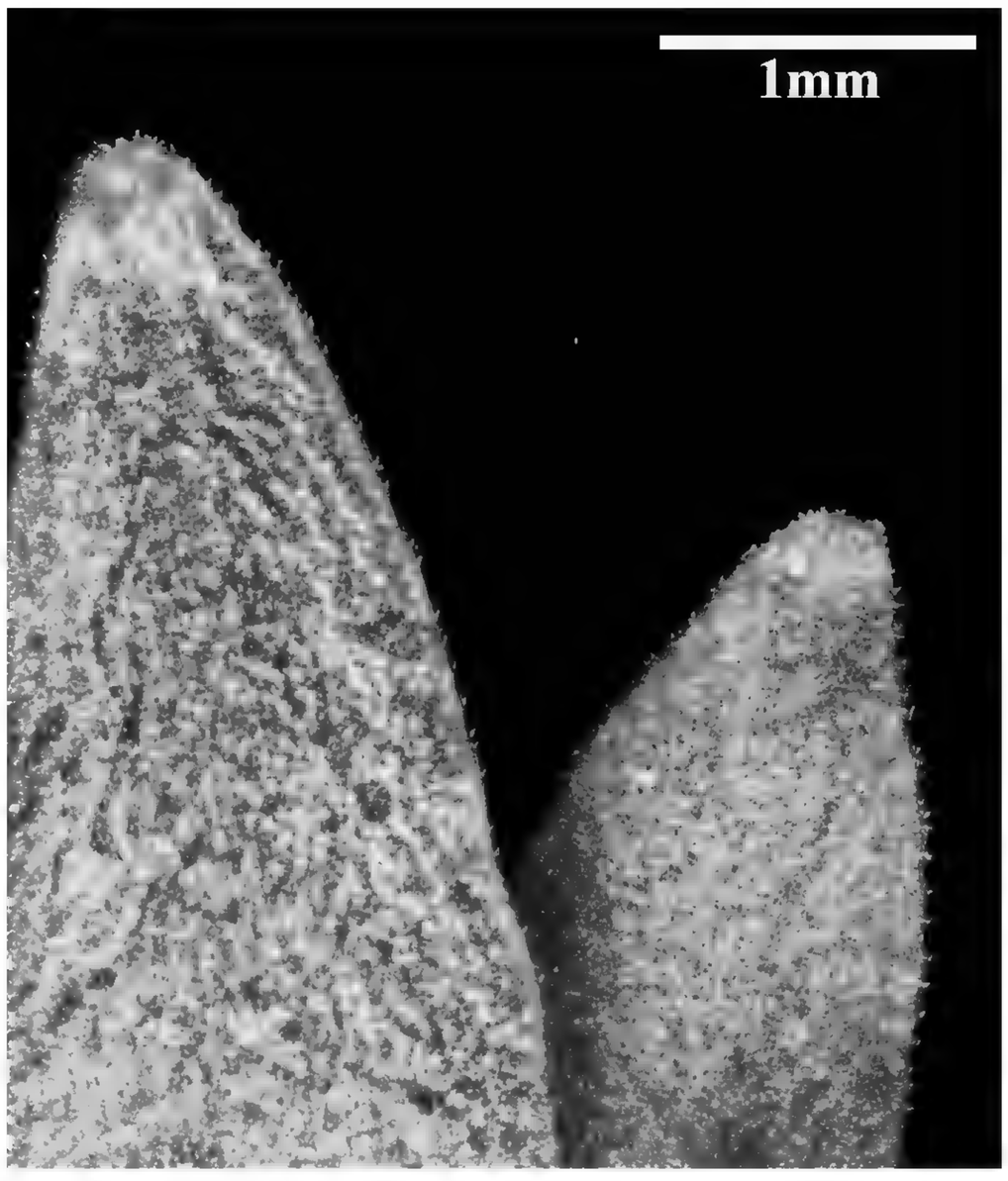

Figure 2. Distal portions of two leaves, showing the elongated papillae on the margins. Photo by Tim Wheeler.

summer timing of these searches would have been past the flowering period of the species, so any vegetative plants may have been overlooked. Few other peaks in the vicinity within the Coeur d'Alene Mountains are high enough to have extensive subalpine vegetation. Most other subalpine to alpine peaks in the region of northern Idaho and northwest Montana have been explored by botanists, as with the botanical survey of subalpine balds in the Coeur d'Alene Mountains (Moseley, 1996).

Conservation and IUCN Red List category. *Douglasia conservatorum* is thus likely to be a narrow endemic of great rarity. I estimate the Bloom Peak population to be only about 500 individual plants. In 2008, roughly 5% of the plants were run over by recreationists on all-terrain vehicles. Conservation measures should be taken immediately to ensure the continued existence of *D. conservatorum* in its wild population. The land is managed by the United States Forest Service, Kootenai National Forest (Montana), and Idaho Panhandle National Forests (Idaho), and a well-used recreation site is maintained within the population of *D. conservatorum*. Three plants were collected in 2008 to introduce the species into cultivation. These are now grown for propagation by Terry McIntosh, Vancouver, Canada.

According to IUCN Red List Categories and Criteria (IUCN, 2001), *Douglasia conservatorum* should be considered Critically Endangered (CR B2a) based on an area of occupancy < 10 km^2 and being known to exist at only a single location.

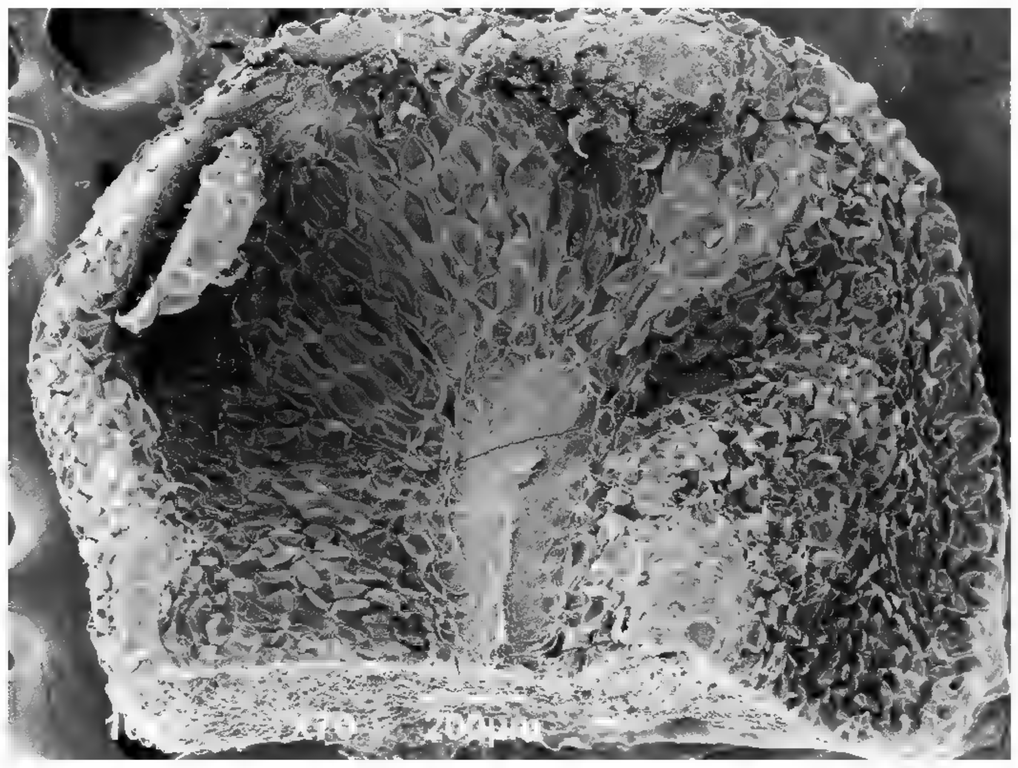

Figure 3. SEM image of a seed of *Douglasia conservatorum* Björk. Photo by Tass Kelso.

Etymology. The epithet *conservatorum* collectively honors all those who contribute time, funds, and efforts toward conservation of biodiversity and wild places. *Douglasia conservatorum* is a strikingly beautiful and rare plant, and one that I feel is particularly appropriate to name in thanks to the conservation community for their hard work and dedication.

Relationships. In having the combination of a subshrubby habit, green and papillate leaves, peduncles with dense stellate hairs, and usually three to six flowers, the Bloom Peak plants are distinct in morphology as compared to other known species in the genus. Some of their characteristics resemble those of *Douglasia laevigata*, which differs in having broader, obovate to oblanceolate leaves and a greater number of flowers per peduncle. *Douglasia idahoensis* differs in having simple or branched peduncle hairs, shorter peduncles (1–6 mm), narrowly lanceolate involucral bracts, and distinctly succulent leaves. *Douglasia montana* differs in having fewer involucral bracts and fewer flowers per peduncle, and usually is a more compact subshrub, forming rounded mounds. *Douglasia nivalis* is similar in leaf shape, but the leaves are grayish with dense stellate hairs. Additionally, the corollas of *D. nivalis* are generally purplish pink, and have darker markings adjacent to the yellow markings at the throat. The nearest known populations of other *Douglasia* species are those of *D. nivalis* 220 km west, *D. montana* 200 km to the east and southeast, and *D. idahoensis* 230 km south.

The precise systematic position of *Douglasia conservatorum* is beyond the topic of this paper, but the lack of marcescent leaves on the stems is shared with all other members of the temperate species, while marcescent leaves are found in all (sub)Arctic species except the anomalous species *D. alaskana* (Kelso, 2009). All of the characteristics of *D. conservatorum*

are found in various other combinations in other species, except that of the papillate leaves. The geographic isolation of this species probably prevents gene flow with other species in the genus. This, in combination with its morphological isolation, supports the recognition of the Bloom Peak population as a distinct species.

Paratype. U.S.A. **Idaho:** Shoshone Co., Bloom Peak on Idaho/Montana state line, 6 to 7 air mi. ENE from Shoshone Work Camp, Coeur d'Alene Natl. Forest, NW 1/4 of Sect. 21 T51N R5E, 25 June 1986, *F. D. Johnson & C. L. Johnson 1626* (ID).

The holotype was selected to be *Sondenaa 379* (ID), which demonstrates vegetative and reproductive characters. The specimen *F. D. Johnson 1626* (ID) includes plants in late flower and with immature fruits. I declined to collect new material sufficient for a type specimen due to the extreme rarity of the species. In the future, additional specimens will be obtained from cultivated plants.

Key to Species of *Douglasia*

1a. Plants forming a single leaf rosette, not suffrutescent; pedicels several times longer than the peduncle at anthesis; (sub)Arctic. . . . . *D. alaskana*
1b. Plants with numerous leaf rosettes, pulvinate or suffrutescent; pedicels shorter than to about equal to the peduncle at anthesis; range various 2
2a. Stems densely covered in marcescent leaves; (sub)Arctic species south to far northwestern British Columbia; (sub)Arctic species. 3
3a. Leaf blades usually glabrous adaxially, margin hairs simple . . . . . *D. arctica*
3b. Leaf blades usually hairy adaxially, sometimes only at the apex, margin hairs simple, forked, or branched . . . 4
4a. Leaves prominently recurved; blade with simple hairs. . . . . *D. ochotensis*
4b. Leaves not prominently recurved; blade with mostly forked or branched hairs. 5
5a. Calyx and bracts glabrous . . . . . *D. gormanii*
5b. Calyx and bracts densely hairy, hairs branched and stellate . . . . . *D. beringensis*
2b. Stems lacking marcescent leaves; temperate species north to Haida Gwaii (Queen Charlotte Islands). 6
6a. Flowers 1 or 2(3) per peduncle; involucral bracts (0)1 to 3; near or east of the Continental Divide in western North America . . . . . *D. montana*
6b. Flowers (2)3 to 7 per peduncle; involucral bracts 5 to 7; mostly west of the Continental Divide 7
7a. Leaves grayish green throughout with dense stellate or branched hairs; corolla purplish pink, usually with dark markings near the throat . . . . . *D. nivalis*
7b. Leaves green, glabrous or ciliate, with simple hairs; corolla deep pink, lacking purplish tones, lacking dark markings near the throat. 8
8a. Peduncle hairs simple and branched; leaves to 2 mm wide, distinctly succulent; involucral bracts lanceolate to narrowly triangular, at least 2× longer than wide; central Idaho. . . . . *D. idahoensis*
8b. Peduncle hairs branched and stellate; leaves at least 2 mm wide, not or scarcely succulent; involucral bracts ovate to broadly elliptic, up to 2× longer than wide; northern Idaho and Montana, or coastal regions 9
9a. Leaves narrowly elliptic (width 1.3–2.6 mm), densely papillate; peduncles densely stellate, grayish green; Coeur d'Alene Mountains in Idaho and Montana . . . . . *D. conservatorum*
9b. Leaves oblanceolate to obovate (width 2–6 mm), smooth, not papillate; peduncles glabrate, not grayish; coastal regions, widespread in northwestern Oregon through coastal British Columbia . . . . . *D. laevigatum*

Acknowledgments. I owe thanks to Terry McIntosh for bringing *Douglasia conservatorum* into cultivation, to Tim Wheeler for the leaf photo, to Tass Kelso for her informative correspondence on this topic and for the SEM photo, to Trevor Goward for his comments on the manuscript, and to Robin O'Quinn for her assistance on a wonderful field day to see *D. conservatorum* in the wild.

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Three New Species of *Pseudobombax* (Malvaceae, Bombacoideae) from Brazil

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Abstract. Three new species of *Pseudobombax* Dugand (Malvaceae, Bombacoideae) are described and illustrated based on material from Brazil. *Pseudobombax minimum* Carv.-Sobr. & L. P. Queiroz is not clearly related to any species of *Pseudobombax* from central-eastern Brazil. However, *P. minimum* may be promptly recognized by its extremely reduced flowers (to 6 cm long) and fruits (to 5.5 cm long), the smallest recorded for *Pseudobombax* to date, in combination with the glabrous androecium and the presence of phalanges. The other two new species, *P. calcicola* Carv.-Sobr. & L. P. Queiroz and *P. parvifolium* Carv.-Sobr. & L. P. Queiroz, seem to be related to *P. grandiflorum* (Cav.) A. Robyns based on the number of leaflets and the absence of phalanges in the androecium, but differ due to the absence of intersecondary veins, the larger ovary, and the fruits angled, but not winged.

Key words: Bombacoideae, Brazil, IUCN Red List, Malvaceae, *Pseudobombax*.

Pseudobombax Dugand is a Neotropical genus belonging to the subfamily Bombacoideae of the Malvaceae (Judd & Manchester, 1997; Baum et al., 1998, 2004; Alverson et al., 1999; Bayer et al., 1999). It encompasses ca. 27 species (Robyns, 1963, 1967; Fernández-Alonso, 1999, 2001; IPNI, 2008), of which ca. 20 occur in Brazil, distributed mainly in the central plateau and northeastern Brazil, in cerrado and caatinga vegetation (in sched. information).

The genus is characterized by mostly unarmed trunks marked with vertical, greenish stripes; leaves that are digitately compound, pulvinate, and clustered at branch tips, with the petiole widened at apex; leaflets that are not articulate at the petiole apex; a persistent calyx that is accrescent in fruit; the receptacle presenting conspicuous glands; the filaments that are partially connate in a tube and the anthers that are monothecate and hippocrepiform; and the capsules with abundant kapok.

Most species of *Pseudobombax* have deciduous foliage during the flowering period (usually the winter season in the Southern Hemisphere). A consequence of this is that herbarium collections of the species of *Pseudobombax* are largely incomplete, which raises doubt in species circumscriptions because it is difficult to match leaves, flowers, and fruit characters. Thus, one of the priorities for the taxonomic study of this genus has been to carry out intensive field studies to gather leaves, flowers, and fruits from the same specimen. This strategy was performed during a survey of this genus in the state of Bahia in eastern Brazil. As a result of these efforts, new collections were obtained resulting in the following three new species, which are described and illustrated herein.

1. **Pseudobombax calcicola** Carv.-Sobr. & L. P. Queiroz, sp. nov. TYPE: Brazil. Bahia: São Félix do Coribe, Serra do Ramalho, ca. 47 km ao S de São Félix do Coribe, na estrada para Alagoinhas, 13°47′22″S, 43°57′32″W, 13 Sep. 2005 (fl., fr.), *J. G. de Carvalho-Sobrinho & L. P. de Queiroz 573* (holotype, HUEFS; isotypes, K, SP). Figure 1.

Haec species foliis 5-foliolatis, petiolo apice paulo dilatato et androecio sine phalangibus *Pseudobombaci parvifolio* Carv.-Sobr. & L. P. Queiroz affinis, sed ab eo habitu candelabriformi, ramis suberosis resinosis, calyce 11–18 mm (vs. 10–11 mm) longo, fructu 1.3–1.5 cm (vs. 2.8–5) lato et seminibus pyriformibus omnino brunneis (vs. reniformibus bicoloribus variegatis) differt.

Tree ca. 4 m; habit candelabriform; trunk striped with alternating bands of grayish bark and greenish underbark; crown open, irregular; branches corky, resinous, often covered with whitish wax at the ends;

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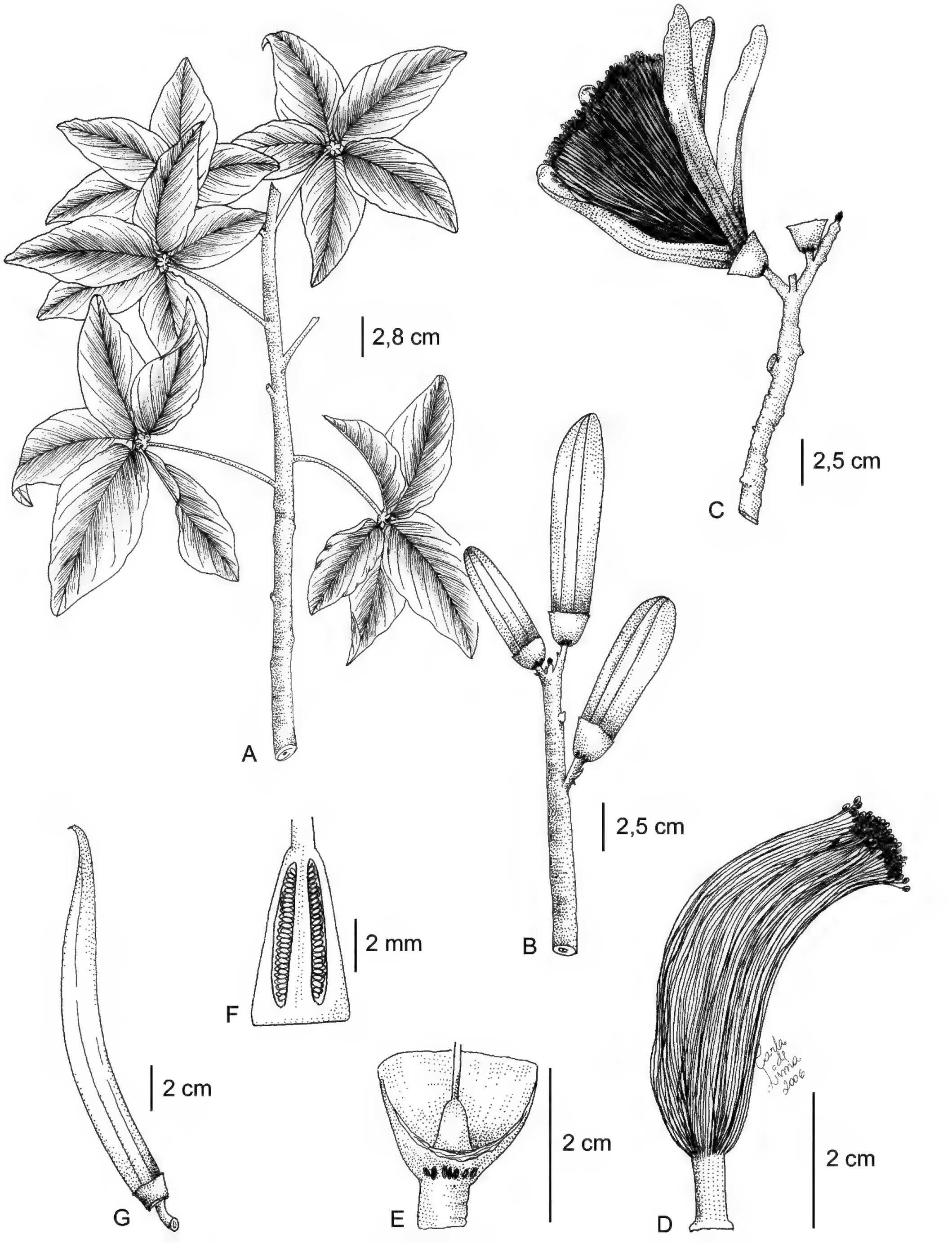

Figure 1. *Pseudobombax calcicola* Carv.-Sobr. & L. P. Queiroz. —A. Leaves. —B. Flower buds. —C. Flower. —D. Androecium. —E. Ovary. —F. Longitudinal section of the ovary. —G. Fruit. A–C drawn from *D. Andrade-Lima 75-8152* (IPA); D–G drawn from the holotype *J. G. de Carvalho-Sobrinho & L. P. de Queiroz 573* (HUEFS).

brachyblasts absent; stipules not seen. Leaves palmately compound, often clustered at the apex of the branches; petiole 45–120 mm, cylindrical, glabrous to puberulent, with whitish wax coating, base flattened, slightly thickened, glandular, glands 1 to many, apex widened ca. 3 mm diam.; petiolule up to 2 mm, furrowed, pulvinulate or not; leaflets 5, coriaceous, usually concave, appearing conduplicate, 4.5–12 ×

2.5–5.5 cm, 2.1–2.9× longer than wide, elliptic, rarely ovate, apex acute to rounded, retuse, base cuneate to attenuate or obtuse, shortly decurrent, margin revolute, inconspicuous and irregularly crenulate, glabrous on both surfaces but with sparse, peltate microtrichomes; abaxial leaflet surface covered with whitish wax coating, midrib vein prominent abaxially, puberulent to glabrescent, secondary veins in 11 to 17 pairs, impressed on both surfaces, inconspicuous distally, intersecondary veins absent, tertiary veins simple, branched or retroflexed. Inflorescence terminal, solitary or in 2-flowered cymes, buds oblong-linear, to 9.5 cm; pedicel 6–20 × 2–9 mm, puberulent, glabrescent or glabrous, glandular or not; bracteoles 3, along the pedicel, 2–4 × 4–5 mm, triangular, covered by peltate microtrichomes, shortly aristate or not, slightly concave, margin denticulate, with sparse, tufted trichomes. Flowers 9–14 cm; receptacle 5–6 mm, puberulent to glabrescent, with 1 whorl of 10 to 20 glands; calyx 11–18 × 20–22 mm, campanulate to suboblong, truncate, 5-apiculate or not, outer surface glabrous but with peltate microtrichomes, inner surface sericeous, glabrous at base; petals 9–14 × 0.9–1.9 cm, oblong to linear, apex rounded to acute, outwardly brownish green when dry, covered with tufted, rigid hairs, inner surface sericeous, longitudinal lines of simple trichomes on one half, ramified and thin on the other half, tomentose at the base; stamens ca. 300, staminal tube 10–18 × 4–6 mm, 2.5–2.8× longer than wide, glabrous or pubescent, phalanges absent, filaments free, 70–120 mm, with anthers 3–4 mm; ovary 11–14 × ca. 4 mm, conical to oblong, 5-angled, glabrous; style 80–140 mm, sparsely puberulent to glabrous, with tufted trichomes. Capsule 10.5–20.5 × 1.3–1.5 cm, oblong, 5-angled, apex acute, apiculate, valves coriaceous, but not woody, glabrous; kapok brown; seeds 3–4 × ca. 2.5 mm, pyriform, clear brown, not spotted; hilum not prominent.

Distribution, habitat, and ecology. *Pseudobombax calcicola* has a narrow geographic range, between 13°S and 14°S latitude and 43°W and 44°W longitude, and is probably endemic to calcareous outcrops in caatinga vegetation, in the São Francisco River valley in western Bahia, Brazil. The sampled population presented many clustered individuals and seems to be endangered by the forest devastation for charcoal production (Carvalho-Sobrinho, pers. obs.). Additionally, none of the known populations of this species are located in protected areas (Secretaria de Estado do Meio Ambiente dos Recursos Hídricos et al., 2006).

IUCN Red List category. *Pseudobombax calcicola* should be considered Endangered (EN B1ab [i,ii,iii,iv]) according to IUCN Red List criteria (IUCN, 2001).

Phenology. The new species was collected in flower from July to September, and in fruit in September.

Etymology. The specific epithet is from the Latin, in reference to the habitat of the species on calcareous outcrops.

Discussion. *Pseudobombax calcicola* is known from just three collections. The earliest specimen, collected by Dárdano de Andrade-Lima in 1975 in Bom Jesus da Lapa municipality, bears leaves and flowers only. Two additional collections were obtained from a population in São Félix do Coribe municipality, one bearing leaves only (in April) and another bearing flowers and fruits (in September); these collections confirm that *P. calcicola* is indeed a new species.

This species presents a very distinctive aspect, with trees ca. 4 m tall, with an opened, very reduced crown, and short, corky branches that give the trees a candelabriform aspect (illustrated by Andrade-Lima, 1977: 189). It is characterized by leaves with five leaflets, with the petiole apex only slightly swollen (only to 3 mm diam.); the leaflets are coriaceous, elliptic, appearing conduplicate (often folded in herbarium sheets), with secondary veins distally inconspicuous; the calyx is glabrous but with peltate microtrichomes outside; and the fruits are oblong, 5-angled, and apiculate, with valves coriaceous, but not woody. Additionally, on herbarium sheets the adaxial surface of the leaflets usually presents a clearer color near the midrib, the abaxial surface is whitish, and the petiole and the midrib are sometimes furrowed. Another feature of this species is the resin released during the drying process, which is evident on the papers used to press the material.

Pseudobombax calcicola seems to be related to *P. grandiflorum* (Cav.) A. Robyns and *P. parvifolium* Carv.-Sobr. & L. P. Queiroz by the leaves with five elliptic leaflets, the similar length of the petals, and the absence of phalanges in the androecium. However, it differs from the former by the absence of intersecondary veins, the larger calyx (11–18 × 20–22 mm vs. 8–14 × 12–20 mm, respectively), the 5-angled fruits (vs. 5-winged), and the pyriform seeds (vs. subreniform). From the latter, it differs by its coriaceous leaflets (vs. chartaceous), larger calyx (11–18 × 20–22 mm vs. 10–11 × 12–19 mm), fewer stamens (ca. 300 vs. ca. 450), and pyriform seeds (vs. reniform). It is further distinguished from these two species by the leaflets with acute to rounded, retuse apices (vs. mucronate in *P. grandiflorum* and acuminate in *P. parvifolium*), the larger ovary (11–14 mm long vs. 5–6 mm in *P. grandiflorum* and ca.

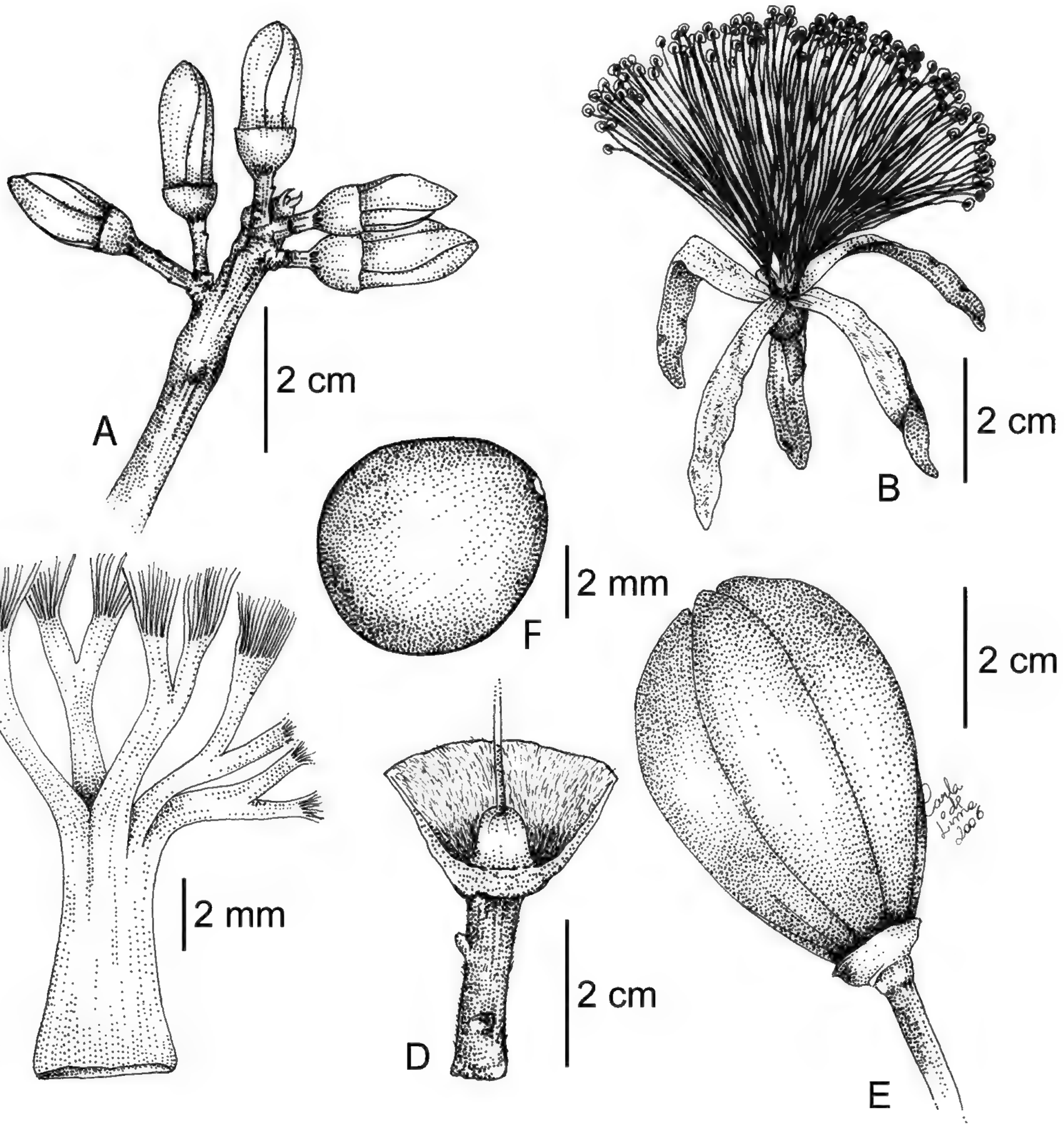

Figure 2. *Pseudobombax minimum* Carv.-Sobr. & L. P. Queiroz. —A. Inflorescence. —B. Flower. —C. Androecium. —D. Ovary. —E. Fruit. —F. Seed. A drawn from *Pereira & Alvarenga 3114* (RB); B–F drawn from the holotype, *R. C. Forzza, M. Magenta, J. V. Coffani-Nunes & C. Kameyama 1591* (SPF).

8 mm in *P. parvifolium*), and the narrower fruits (13–15 mm wide vs. 22–30 mm in *P. grandiflorum* and 28–50 mm in *P. parvifolium*).

Paratypes. BRAZIL. **Bahia:** Bom Jesus da Lapa, Faz. Serra Solta, 17 July 1975 (lf., fl.), *D. Andrade-Lima 75-8152* (IPA 46217, IPA 46217-A); São Félix do Coribe, 13°47′23″S, 43°57′31″W, 10 Apr. 2005 (lf.), *J. G. de Carvalho-Sobrinho, E. B. Miranda, R. M. Castro & S. F. Conceição 485* (CEPEC, HUEFS, K, SP).

2. Pseudobombax minimum Carv.-Sobr. & L. P. Queiroz, sp. nov. TYPE: Brazil. Goiás: Nova Roma, estrada Nova Roma–Teresina de Goiás, vilarejo Aboboreira, 13°33′S, 47°04′W, 31 July 2000 (fl., fr.), *R. C. Forzza, M. Magenta, J. V. Coffani-Nunes & C. Kameyama 1591* (holotype, SPF; isotypes, HUEFS, SP). Figure 2.

Haec species calyce externe sicut tubo staminali glabro et staminibus sat paucis (180 ad 250) *Pseudobombaci campestri* (Mart. & Zucc.) A. Robyns affinis, sed ab eo calyce 3–5 mm (vs. 9–11 mm) longo, petalis 50–55 mm (vs. 11–13 mm) longis et fructu 3.5–5.5 cm (vs. 6–8.5 cm) longo differt.

Tree ca. 4 m; trunk striped with alternating bands of grayish bark and greenish underbark; branches glabrous, not resinous, without wax; brachyblasts absent; stipules not seen. Leaves not seen. Inflorescences solitary or in biflorous cymes, terminal to subterminal, peduncles, when present, to 10 mm; flower buds ovate, oblong, to obovate, to 50 × 10–13 mm; pedicel 9–12(–20 when in fruit) × 2–3 mm, glabrous; bracteoles 3, alternating along the pedicel, ca. 2 × 2.5 mm. Flowers ca. 6 cm; receptacle 2–3 mm, with 1 whorl of 6 to 12 glands, glabrous except for peltate microtrichomes; calyx 3–5 × 8–12 mm,

campanulate, truncate, slightly apiculate, outer surface glabrous except occasionally with sparse, peltate microtrichomes, inner surface glabrous on the basal third, sericeous on the remainder; petals 50–55 × 7–10 mm, linear to lanceolate, outwardly brownish green, covered with tufted, rigid hairs, inwardly covered by a strip of slender, branched hairs and a strip of simple hairs; stamens 180 to 250, staminal tube 5–10 × 2–4 mm, 1.5–5× longer than wide, glabrous, continuing in 5 phalanges, each 3–5 mm, forked as 10, filaments free for 35–45 mm, anthers 2–3 mm; ovary ca. 4 × 2 mm, ovate to oblong, glabrous, peltate microtrichomes occasionally present, style 50–70 mm, glabrous. Capsule 3.5–5.5 × 2–3 cm, oblong to slightly obovate, valves woody, glabrous; kapok copious, golden; seeds ca. 5 mm diam., subglobose, glabrous, evenly blackish colored; hilum raised.

Distribution, habitat, and ecology. *Pseudobombax minimum* has a narrow geographic range, between 11°S and 16°S latitude and 44°W and 47°W longitude. It occurs only at the eastern border of the central Brazilian plateau, ranging from western Bahia to eastern Goiás, at elevations of about 600 m. It is known in cerrado and seasonally dry forests (Carvalho-Sobrinho, pers. obs.). Some populations seem to be endangered by the expansion of soybean plantations and growing urbanization in Bahia.

IUCN Red List category. *Pseudobombax minimum* should be considered Vulnerable (VU A4c) according to IUCN Red List criteria (IUCN, 2001).

Phenology. The new species was collected in flower from June to August and in fruit in September.

Etymology. Due to its extremely reduced flowers and fruits, the smallest recorded for the genus to the present, this new species was named from the Latin for minimum, contrasting with *Pseudobombax maximum* A. Robyns, which presents flowers 15–24 cm long, the longest found in the genus.

Discussion. Within its range, *Pseudobombax minimum* is promptly recognized by its reduced flowers (to 6 cm) and fruits (to 5.5 cm). *Pseudobombax minimum* is not clearly related to any species of *Pseudobombax* from central and eastern Brazil. It is similar to *P. campestre* (Mart. & Zucc.) A. Robyns in its androecium with relatively few stamens (180 to 250) and the glabrous receptacle, calyx, and staminal tube; however, *P. minimum* differs from *P. campestre* by its smaller calyx (3–5 mm vs. 9–11 mm long, respectively), smaller flowers (to 6 cm vs. 10–12 cm long), and smaller fruits (to 5.5 cm vs. 6–8.5 cm long). Furthermore, *P. campestre* is known only from campo rupestre vegetation in the Serra do Espinhaço in Bahia and Minas Gerais states, at altitudes between 1150 and 1500 m.

Paratypes. BRAZIL. **Bahia:** Riachão das Neves, estr. Riachão das Neves–Barreiras, 11°46′S, 44°54′W, 3 June 1999 (fl.), *E. Melo, F. França & B. M. Silva 2763* (HUEFS); estr. Brasília–Fortaleza, entre o Rio Corrente e Santa Maria, 4 July 1964 (fl.), *J. M. Pires 58152* (NY). **Goiás:** Flores de Goiás, beira da estrada, 3 June 1984 (fl.), *A. Negrett s.n.* (IBGE, R); Natividade, 23 July 1955 (fl.), *A. Macêdo s.n.* (Herb. A. Macêdo, RB); Teresina de Goiás, prox. ao entroncamento da estr. Teresina de Goiás–Campos Belos com estr. para Nova Roma, 13°30′S, 47°30′W, 3 July 1996 (fl.), *B. A. S. Pereira & D. Alvarenga 3114* (IBGE, R, RB); Rio Praim (Rio Paraná basin), 16°40′S, 47°W, 16 Aug. 1982 (fl.), *J. A. Ratter 4736* (UEC).

3. Pseudobombax parvifolium Carv.-Sobr. & L. P. Queiroz, sp. nov. TYPE: Brazil. Bahia: Tucano, ca. 25 km NW do povoado de Bizamum, 10°53′29″S, 38°58′40″W, 12 Nov. 2005 (fl., fr.), *J. G. de Carvalho-Sobrinho, D. Cardoso, Sr. João, P. Oinonen & M. Jonsson 751* (holotype, HUEFS; isotypes, K, NY). Figure 3.

Haec species calyce petalisque sat parvis, androecio sine phalangibus et fructu externe glabro *Pseudobombaci grandifloro* (Cav.) A. Robyns affinis, sed ab eo foliolo pagina abaxiali indumento praedita (vs. glabra), tubo staminali pubescenti (vs. glabro) et ovario ca. 8 mm (vs. 5–6 mm) longo differt.

Tree 5–8 m; trunk striped with alternating bands of grayish bark and greenish underbark; branches glabrescent, not resinous, covered or not with whitish wax when young; brachyblasts absent; stipules not seen. Leaves palmately compound, clustered at apex of the branches; petiole 20–110 mm, thin, flattened, furrowed on the upper side, puberulent to glabrescent, with sparse branched trichomes, with small glands along its length, base slightly thickened, usually glaucous, apex slightly widened, ca. 2–3 mm diam.; petiolule absent; leaflets (3 to)5 to 7, chartaceous, usually plane, sometimes concave, appearing conduplicate, 20–78 × 8–32 mm, 2.4–4.3× longer than wide, subelliptic, elliptic, oblanceolate, narrowly oblanceolate, or ovate-lanceolate, apex acute to acuminate, base cuneate to slightly attenuate, margin revolute, entire, rarely inconspicuous and irregularly crenulate, both surfaces glabrescent, with sparse peltate microtrichomes, abaxial surface with branched trichomes over the veins, midrib vein prominent abaxially, secondary veins in 9 to 12 pairs, impressed on both surfaces, intersecondary veins absent, tertiary veins simple, branched or retroflexed. Inflorescences terminal, solitary, buds oblong to lanceolate; pedicel 6–24 × 2–7 mm, 2–6.6× longer than wide, erect to incurved, puberulent or not; bracteoles 3 to 5, along the pedicel. Flowers ca. 10 cm; receptacle 2–3 mm,

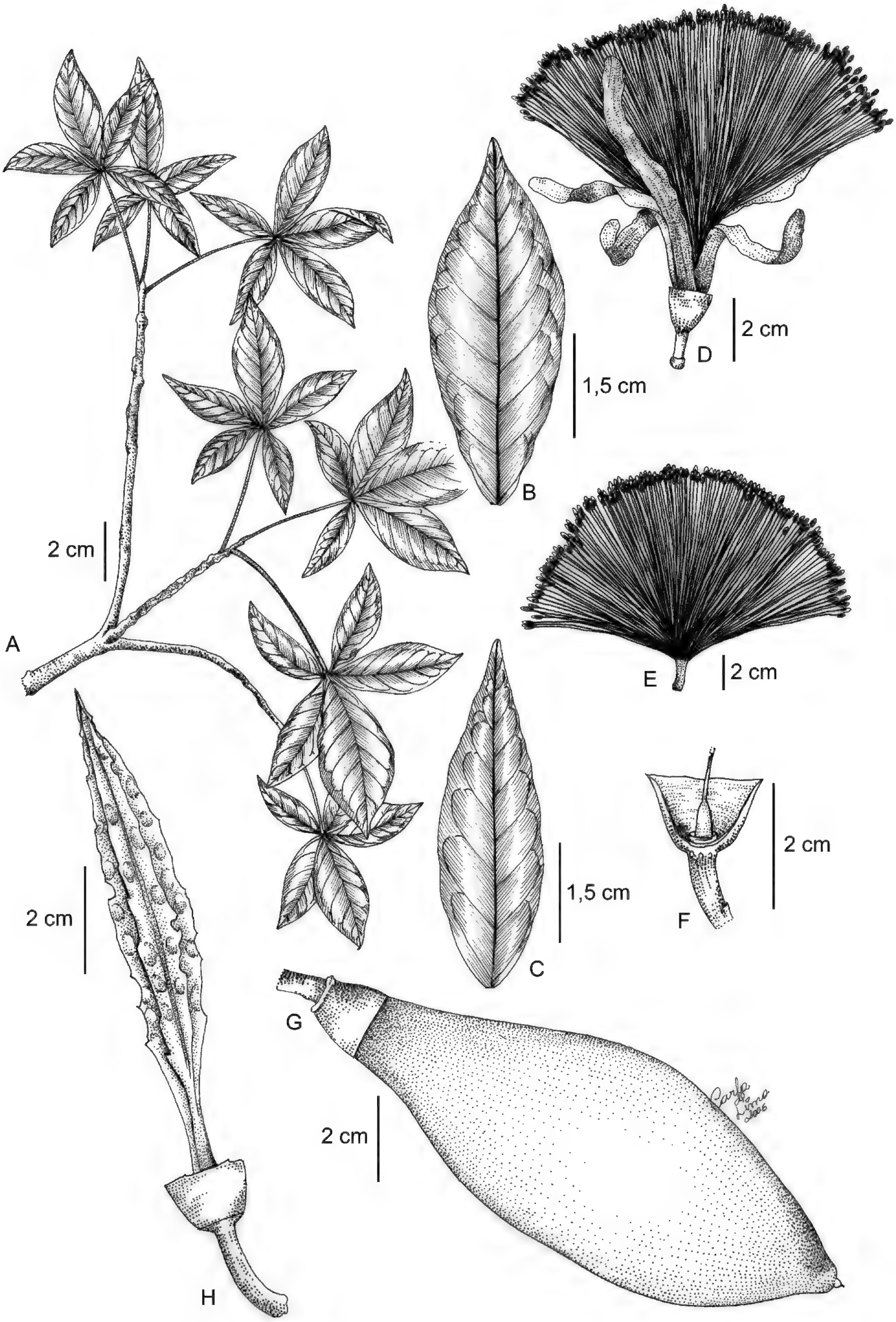

Figure 3. *Pseudobombax parvifolium* Carv.-Sobr. & L. P. Queiroz. —A. Leaves. —B. Ovate leaflet. —C. Obovate leaflet. —D. Flower. —E. Androecium. —F. Ovary. —G. Fruit. —H. Replum. A–C drawn from *J. G. de Carvalho-Sobrinho et al. 250* (HUEFS); D–F drawn from the holotype, *J. G. de Carvalho-Sobrinho, D. Cardoso, Sr. João, P. Oinonen & M. Jonsson 751* (HUEFS); G drawn from *J. G. de Carvalho-Sobrinho et al. 752* (HUEFS); H drawn from *J. G. de Carvalho-Sobrinho et al. 246* (HUEFS).

with 1 whorl of ca. 10 glands; calyx 10–11 × 12–19 mm, cupular to campanulate, truncate, sometimes inconspicuously 5-apiculate, outwardly puberulent, with short, branched trichomes, sometimes with peltate microtrichomes, sericeous on the upper half internally; petals 98–130 × 6–15 mm, linear to lanceolate, apex acute, brown to cream externally, usually with longitudinal stripes when dry, tomentose almost to base, pubescent internally, covered with tufted, rigid hairs, inwardly covered by a strip of slender, branched hairs and a strip of simple hairs; stamens ca. 450, staminal tube 7–15 × 3–8 mm, 1.5–5× longer than wide, pubescent, phalanges absent, filaments free for 80–110 mm, anthers 1–3 mm; ovary ca. 8 × 3–6 mm, ovate, slightly 5-angled, subglabrous except for peltate microtrichomes; style ca. 135 mm, subglabrous except for peltate microtrichomes mainly on basal portion. Capsule 9.5–13.5 × 2.8–5 cm, oblong to oblong-elliptic, slightly 5-angled, apiculate to 10 mm, base cuneiform, ca. 15 mm wide, valves woody, glabrous; kapok clear brown; seeds ca. 5 × 2–3 mm, reniform, dark brown, slightly striped; hilum not prominent, slightly darker.

Distribution, habitat, and ecology. *Pseudobombax parvifolium* is endemic to caatinga vegetation in northeastern Brazil, in the states of Bahia and Sergipe (Canindé do São Francisco municipality).

IUCN Red List category. *Pseudobombax parvifolium* should be considered Near Threatened (NT) according to IUCN Red List criteria (IUCN, 2001).

Phenology. The new species was collected in flower from August to January and in fruit from November to February.

Etymology. The specific epithet derives from the Latin "parvus" (meaning "small") and "folium" (meaning "leaf"), in reference to the diminutive size of the leaflets in this species.

Discussion. *Pseudobombax parvifolium* is characterized by leaves with five to seven glabrescent leaflets (rarely three), as well as the apex of the petiole that is slightly swollen (2–3 mm diam.); the calyx has branched, short and rigid trichomes on the outer surface; the androecium lacks phalanges and the staminal tube is pubescent; the ovary is glabrate (except for the peltate microtrichomes); and the seeds are reniform.

The five, elliptic to oblanceolate, glabrate leaflets, the flowers without phalanges, and the relatively small size of the calyx and petals are all characters that relate *Pseudobombax parvifolium* to *P. grandiflorum*. The new species, however, differs by the absence of intersecondary veins, the presence of branched trichomes on the outer surface of the calyx (vs. the calyx glabrous) and on the abaxial surface of the leaflets (vs. leaflets glabrate), the petals pubescent on their entire inner surface (vs. glabrous in lower third), the pubescent staminal tube (vs. glabrous), the slightly 5-angled fruits (vs. 5-winged), and reniform and striped seeds (vs. subreniform and spotted). Further, *P. parvifolium* is known only from caatinga vegetation (Carvalho-Sobrinho, pers. obs.), while *P. grandiflorum* occurs mainly in coastal restinga vegetation and tropical rainforest and in semi-deciduous forests up to 150 km from the sea (Carvalho-Sobrinho, pers. obs.).

Among the *Pseudobombax* species found in caatinga vegetation, *P. parvifolium* is most similar to *P. calcicola*; in both species the leaves have five sessile to subsessile leaflets and the androecium lacks phalanges. It differs from *P. calcicola* by the branches that are not corky or resinous, the acuminate leaflets (vs. retuse), the presence of short, branched trichomes on the abaxial leaflet surface (vs. leaflets glabrous), the outer surface of the calyx covered by branched hairs mixed with peltate microtrichomes (vs. only with peltate microtrichomes), wider fruits (28–50 mm vs. 13–15 mm wide), and reniform seeds (vs. pyriform).

Paratypes. BRAZIL. **Bahia:** Angüera, ca. 22 km W de Feira de Santana, estrada do Feijão, entrada da Faz. Campo Alegre, 12°11′30″S, 39°9′26″W, 16 Jan. 2006 (lf., fl.), *L. P. Queiroz & D. Cardoso 12000* (HUEFS); Caturama, Morro Branco, 13°17′45″S, 42°12′1″W, 6 July 2007 (fl., fr.), *A. A. Conceição, M. A. Colaço, G. Costa, D. Cardoso & F. B. L. Silva 2424* (HUEFS); Itiúba, 10°38′59″S, 39°52′33″W, 17 Aug. 2002 (fl.), *L. P. Queiroz, C. Correia, J. Costa & J. G. Nascimento 7343* (HUEFS, SPF); 10°38′59″S, 39°59′33″W, 19 Apr. 2004 (lf., fr.), *T. S. Nunes, J. G. Carvalho-Sobrinho, J. G. Nascimento & C. Machado 1131* (HUEFS); 10°38′26″S, 39°52′50″W, 19 Apr. 2004 (lf., fr.), *J. G. de Carvalho-Sobrinho, T. S. Nunes & J. G. Nascimento 246* (HUEFS), 19 Apr. 2004 (lf.), *J. G. de Carvalho-Sobrinho, T. S. Nunes & J. G. Nascimento 248* (HUEFS); Jeremoabo, Serra Branca (Raso da Catarina), Faz. Raposa, 10°15′S, 38°21′W, 26 June 2004 (lf.), *J. G. de Carvalho-Sobrinho, A. C. Assunção & Sr. Moacir 250* (HUEFS); 5 km N na estrada para Faz. Natur. (Brejinho), 10°3′0″S, 38°21′27″W, 12 Aug. 2005 (lf.), *J. G. de Carvalho-Sobrinho, E. B. Miranda, A. Rapini, A. C. R. Cruz & A. S. Farias 572* (HUEFS); Quijingue, ca. 31.5 km NW de Tucano, Faz. Juazeiro Novo, 10°55′51″S, 39°3′49″W, 12 Nov. 2005 (fl., fr.), *J. G. de Carvalho-Sobrinho, D. Cardoso, Sr. João, P. Oinonen & M. Jonsson 752* (HUEFS); Tanquinho, 24 Nov. 1991 (fl.), *I. Crepaldi & M. V. Oliveira 06* (HUEFS); Tucano, subida para a Serra das Candeias, 10°55′59″S, 39°4′40″W, 13 Nov. 2005 (fl.), *J. G. de Carvalho-Sobrinho, D. Cardoso, Sr. João, P. Oinonen & M. Jonsson 753* (HUEFS); povoado Bizamum, Serra Grande, 10°51′18″S, 38°2′14″W, 21 Apr. 2005 (lf.), *D. Cardoso, W. J. Lima, A. L. Santana & J. G. N. Andrade 502* (HUEFS). **Sergipe:** Canindé de São Francisco, Curutuba, beira da estrada, 18 Oct. 1999 (lf., fl.), *R. A. Silva 1163* (HRB); Faz. Brejo, 26 Sep. 2000 (lf., fl.), *L. M. Cordeiro, P. R. M. Belchior & A. G. Magalhães 190* (HRB).

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Astragalus beitashanensis, a New Species of Leguminosae from Xinjiang, China

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Abstract. The new species *Astragalus beitashanensis* W. Chai & P. Yan (Leguminosae) is described from Xinjiang, China. *Astragalus beitashanensis* is similar to *A. laguroides* Pall., but differs by its elliptic to suborbicular leaflets that are 4–9 × 3–6 mm, ovate bracts, and deeply emarginate standard.

Key words: *Astragalus*, China, IUCN Red List, Leguminosae, Xinjiang.

Astragalus L. is comprised of about 2500 to 3000 species, which are distributed mainly in arid and semi-arid mountainous regions of the Northern Hemisphere as well as in South America and Africa (Podlech, 1986; Chang et al., 2007). It is considered perhaps the largest genus of vascular plants and the most complex group within the family Leguminosae (Podlech, 1986; Ranjbar & Karamian, 2003). China is one of the largest centers of diversity for the genus with 388 species, of which 210 are endemic (Chang et al., 2007; Podlech & Xu, 2007).

For the preparation of the Leguminosae for the *Flora Xinjiangensis*, herbarium specimens of *Astragalus* were examined by the first author from the herbaria at HNWP, LZD, PE, SHI, WUK, and XJBI. Moreover, in expeditions, many of these species were studied in the field by the authors. During this investigation, a new and distinctive species of *Astragalus* was discovered and is described here.

Astragalus beitashanensis W. Chai & P. Yan, sp. nov. TYPE: China. Xinjiang: Qitai, Mt. Beita, sunny hillside, 3000 m, 21 July 2000, *Q. G. Liu & L. Yu 057* (holotype, SHI; isotype, WUK).

Species *Astragalo laguroidi* Pall. affinis, sed ab eo foliolis ellipticis usque suborbicularibus 4–9 × 3–6 mm, bracteis ovatis ca. 2.5 mm longis, calycis dentibus triangularibus 2–3 mm longis, vexillo profunde emarginato lobulis ca. 2 mm longis, alis late emarginatis atque legumine immaturo piloso differt.

Plants perennial, ca. 5 cm tall, acaulescent. Stipules greenish, 4–6 mm, adnate to the petiole to 1/2 of length, lower stipules widely ovate, acute, sparsely hairy, upper stipules ovate-lanceolate, acuminate, densely pubescent; leaves 3–6 cm, petiole 1.5–2.5 cm, like the rachis very densely covered with appressed white trichomes; leaflets in 3 to 5 pairs, elliptic to suborbicular, obtuse, 4–9 × 3–6 mm, pubescence sparse adaxially but densely pubescent abaxially with appressed ± medifixed white trichomes 0.5–0.9 mm. Peduncles 1.5–3 cm, shorter than the leaves, densely covered with ascending white hairs; racemes ovate, 3–3.5 cm, congested with 6 to 11 flowers; bracts whitish green, membranous, with greenish midvein, ovate or ovate-lanceolate, ca. 2.5 mm, sparsely pubescent with ascending white and black hairs, at the margins densely covered with spreading white trichomes to 1.2 mm. Calyx soon becoming inflated, oblong to elliptic, 13–15 mm, bifid between the 2 upper teeth to 1/4 of tube length, adaxially covered with subappressed to ascending very asymmetric and bifurcate white trichomes, 0.5–1.5 mm long, abaxially covered with flexuose, appressed ± medifixed, black hairs, 0.2–0.6 mm, with a few longer, white hairs mixed in; calyx teeth green with reddish margins, triangular, 2–3 mm, externally covered with ascending, very asymmetric and bifurcate, black hairs to 1 mm on the margins, internally covered with long soft, entangled, white hairs; corolla with petals purplish red; standard ca. 23 mm, limb ca. 11 × 9 mm, elliptic, deeply emarginate to 2 mm, abruptly contracted into a wide, cuneate claw ca. 12 mm; wings ca. 21 mm, oblong, widely emarginate, ca. 9 × 3 mm, auricle ca. 1 mm, claw 12–13 mm; keels ca. 19 mm, limbs obliquely obovate, ca. 6 × 3 mm, auricle ca. 0.5 mm, claw ca. 13 mm; ovary with the stipe ca. 1 mm, hairy, style pubescent only at the base. Legumes (only immature seen) subsessile, oblong, ca. 8 mm, unilocular, very densely covered with spreading, basifixed white trichomes to 1.7 mm, with a few sub-basifixed ones mixed in, the short beak covered with ascending black or black and white hairs; seeds unknown.

Distribution and habitat. *Astragalus beitashanensis* is known only from its type locality in the Beitashan region, Qitai County, Xinjiang, China, at about 3000 m elevation, on gravelly mountain slopes.

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IUCN Red List category. *Astragalus beitashanensis* is threatened by global warming and stock breeding, and its conservation status is evaluated as Endangered (EN) according to IUCN Red List criteria (IUCN, 2001). Two mature plants of this species were found on Beitashan in 2000, and it was not seen during our second expedition in the area in 2008. *Astragalus beitashanensis* is known only from the holotype and isotype collections from Beitashan; therefore, it may be rare and endemic to the area. The altitude at which this species' habitat occurs will increase as the overall temperature of the Earth's atmosphere gradually increases; while it is currently distributed at altitudes ca. 3000 m, this will likely increase to ca. 3400 m.

Phenology. The new species is known to flower in July and August.

Etymology. The new species epithet is taken from the mountain Beitashan in Xinjiang, China.

Discussion. *Astragalus beitashanensis* belongs to *Astragalus* sect. *Laguropsis* Bunge as its plants are acaulescent, the leaves are pubescent with appressed, more or less medifixed trichomes, and the calyx is vesicularly inflated, enveloping the pod.

Astragalus beitashanensis is similar to *A. laguroides* Pall. in overall height and in its acaulescent plants and leaf pubescence with appressed, medifixed trichomes. It differs from *A. laguroides* by its elliptic to suborbicular leaflets, measuring 4–9 × 3–6 mm (vs. lanceolate to elliptic, 10–20 × 4–8 mm), ovate bracts, ca. 2.5 mm long (vs. linear, 5–7 mm), triangular calyx teeth, 2–3 mm long (vs. subulate, 3–4 mm), deeply emarginate flower standard (vs. shallowly emarginate), widely emarginate wings (vs. entire), and the ovary pubescent with white and black trichomes (vs. only white trichomes).

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Tropidogyne, a New Genus of Early Cretaceous Eudicots (Angiospermae) from Burmese Amber

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ABSTRACT. †*Tropidogyne pikei* K. L. Chambers, Poinar & R. T. Buckley, representing a new genus and species, is described from an Early Cretaceous flower preserved in Burmese amber. †*Tropidogyne* may occupy a stem or early crown position in the phylogeny of the rosid clade. Its floral morphology, while largely plesiomorphic, can be compared with the modern family Cunoniaceae. The flower of the fossil taxon is small, bisexual, epigynous, apetalous, with five regular sepals slightly connate at the base, 10 stamens, the one preserved anther having two thecae that dehisce by longitudinal slits, an ovary of three carpels surmounted by a conspicuous disc, three short, acute styles, and a 10-ribbed inferior ovary. At the summit of each rib of the †*Tropidogyne* ovary is a small, darkly stained patch of tissue, interpreted here as a secretory gland.

Key words: Amber, Burma (Myanmar), Cunoniaceae, Early Cretaceous, eudicot flower, eurosid clade, fossilized resin.

Burmese amber has yielded a wealth of arthropod and plant remains (Poinar et al., 2005), including some very interesting angiosperm fossils. These include flowers with affinities to the family Monimiaceae (Poinar & Chambers, 2005), Cornaceae (Poinar et al., 2007b), and the rosid clade of eudicots (Poinar et al., 2008), as well as two early bambusoid grasses (Poinar, 2004). In the present paper, we describe an additional flower from the same amber deposit in the Hukawng Valley in Burma (Myanmar).

MATERIALS AND METHODS

The amber was derived from a mine first excavated in 2001, in the Hukawng Valley, southwest of Maingkhwan in the state of Kachin (26°20′N, 96°36′E) in Burma (Myanmar). This new amber site, known as the Noije Bum 2001 Summit Site, was assigned to the Upper Albian of the Early Cretaceous on the basis of paleontological evidence (Cruickshank & Ko, 2003), placing the age at 97 to 110 million years ago (Ma). Nuclear magnetic resonance (NMR) spectra and the presence of araucaroid wood fibers in amber samples from the Noije Bum 2001 Summit site indicate an araucarian (possibly *Agathis* Salisb.) tree source for the amber (Poinar et al., 2007b).

The well-preserved flower (accession #ab 14), with two missing sepals, is in a rectangular piece of amber 11 mm long, 6 mm wide, and 3 mm thick. Examination and photographs were made with a Nikon stereoscopic microscope SMZ-10 R (Nippon Kogaku K. K., Tokyo, Japan) at 80× and a Nikon Optiphot microscope (Nippon Kogaku K. K.) at 800×. The specimen is deposited in the R. T. Buckley amber collection, Florence, Kentucky 41042-8355, U.S.A, and can be examined by contacting Mr. Buckley, phone (859) 384-8649.

†Tropidogyne K. L. Chambers, Poinar & R. T. Buckley, gen. nov. TYPE: †*Tropidogyne pikei* K. L. Chambers, Poinar & R. T Buckley.

Genus fossile a *Ceratopetalo* Sm. flore tricarpellato (nec bicarpellato), ovario infero (nec semiinfero) atque disco non pubescenti, a †*Platydisco* Schönenberger & Friis flore tricarpellato (nec tetracarpellato) apetalo (nec tetrapetalo) atque ovario infero (nec semiinfero) differt.

Flowers small, bisexual, actinomorphic, epigynous, glabrous; petals none; sepals 5, regular, slightly connate at base, ovate-lanceolate, explanate, with midvein and 3 to 5 minor veins from the base, veins conspicuously anastomosing above; epigynous disc darkly pigmented, 3-lobed, with an irregular margin; stamens 10, diplostemonous, filaments slender, at-

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tached at outer edge of disc; anthers basifixed or dorsifixed, with 2 thecae dehiscing introrsely(?) by longitudinal slits, connective not prolonged; gynoecium 3-carpellate, ovary inferior, styles 3, short, arched-divergent, arising separately from disk, tips acute, stigmas not defined; exterior surface of ovary with 10 pronounced longitudinal ridges, each ridge with a distal pad of differentiated, perhaps glandular, tissue.

Etymology. The generic name is taken from the Greek "tropis," for "ridge" or "keel," and "gyne," for "woman" or "pistil," referring to the distinct ridges on the inferior ovary.

†Tropidogyne pikei K. L. Chambers, Poinar & R. T. Buckley, sp. nov. TYPE: Burma (Myanmar). Kachin: amber mine in the Hukawng Valley SW of Maingkhwan, 26°20′N, 96°36′E, T. Pike #ab 14 (holotype, Burmese amber, R. T. Buckley collection, Florence, KY). Figures 1–3.

Flower ca. 5.1 mm diam.; sepals 1.89–1.97 × ca. 1.05 mm; stamens 10, most filaments damaged and anthers missing, only one complete stamen with anther present; filament ca. 0.76 mm; anther ca. 0.16 × 0.24 mm; filaments of remaining stamens (all without attached anthers) ranging in length from 0.08 to 0.58 mm; ovary inferior, ca. 1.30 mm; remaining peduncle ca. 1.1 mm.

Etymology. The specific epithet honors the discoverer of the flower, Ted Pike.

Discussion

Concerning the preservation of the fossil, the lower two sepals are broken off by a fracture in the amber (they are reconstructed in Fig. 2), and this allows close examination of the inferior ovary from the side. The face of the flower is well spread for viewing (Figs. 1A, 3). Although most of the stamens are broken, one stamen retains its anther (Fig. 1A, left insert), showing that the flower was bisexual in organization. The disc is conspicuous, darkly stained, and bears three short, curved, acute styles. The disc has an irregular margin and is trilobed (Fig. 3A), each lobe assumed to correspond to a carpel. If the disc was secretory, the dark coloration may be an artifact from chemical alteration of nectar on its surface. The reticulate venation of the sepals, with several veins entering from the base, is particularly evident (Fig. 3B), as is a slight connation of sepal tissue near the base. The anthers dehisce on one side by two longitudinal slits (Fig. 1A, left insert), and we suggest that this dehiscence was introrse based on the similarity to certain anthers of Cunoniaceae, as discussed below. Insertion of the filament, which appears basal, would instead be dorsal by similar analogy to these comparable anthers. A notable feature of the ovary is that it has 10 prominent longitudinal ridges or ribs, with five ribs opposite the sepals and five alternating with the sepals (Fig. 1B). On one side of the ovary we noted that each rib has a dark-staining triangular pad of tissue at its distal end (Fig. 1C). This is a regular feature, not an artifact, on all the ribs in this field of view. In other views, this dark tissue appears to be frayed or macerated. We interpret this tissue to be a specialized gland, perhaps secretory, found regularly on all the ribs of the ovary immediately outside the base of the calyx.

For purpose of discussion of an ancient fossil like †*Tropidogyne*, it is useful to present a hypothesis concerning a possible systematic assignment, which may lie with the eurosid clade of eudicots. The type specimen is dated as Late Albian, a time period during which the rosid clade underwent its principal ordinal diversification (Magallón & Castillo, 2009: 352, fig. 1). The genus may represent a stem group or an early member of one of the crown clades. Its floral morphology does not present any obvious apomorphies. Apetaly occurs in at least 10 modern families of rosids (Endress & Matthews, 2006: 231, fig. 11), and it is uncertain whether or not this feature is plesiomorphic in the entire clade. The presence of ribs on inferior ovaries is also common in extant flowers. Their number is often twice the number of sepals because they are formed over the vascular traces (median and synlateral) of the sepals (Endress, 2008: fig. 13). In several salient features, the floral morphology of †*Tropidogyne* resembles members of Cunoniaceae, tribe Schizomerieae, in particular the genus *Ceratopetalum* Sm. Our discussion is based on the descriptions, anatomical studies, and excellent SEM illustrations of this genus from the works of Engler (1930), Hoogland (1960), Dickison (1975, 1989), Hufford and Dickison (1992), Matthews et al. (2001), Bradford and Barnes (2001), Hopkins and Hoogland (2002), Rozefelds and Barnes (2002), Matthews and Endress (2002), and Bradford et al. (2004).

In general form, the fossil resembles *Ceratopetalum* in its regular, spreading calyx of five lanceolate-ovate sepals. The similarity in sepal venation is especially pronounced when comparison is made with modern *Ceratopetalum* (Barnes & Hill, 1999: 638, figs. 3–6) and with the Late Eocene–Early Oligocene fossil †*C. wilkinsonii* R. W. Barnes & R. S. Hill from Australia (Barnes & Hill, 1999: 639, fig. 11; Rozefelds & Barnes, 2002: 670, fig. 10C). Due to obscuring pigmentation, it is not possible to tell whether there is basal fusion of the lateral veins of adjacent sepals in

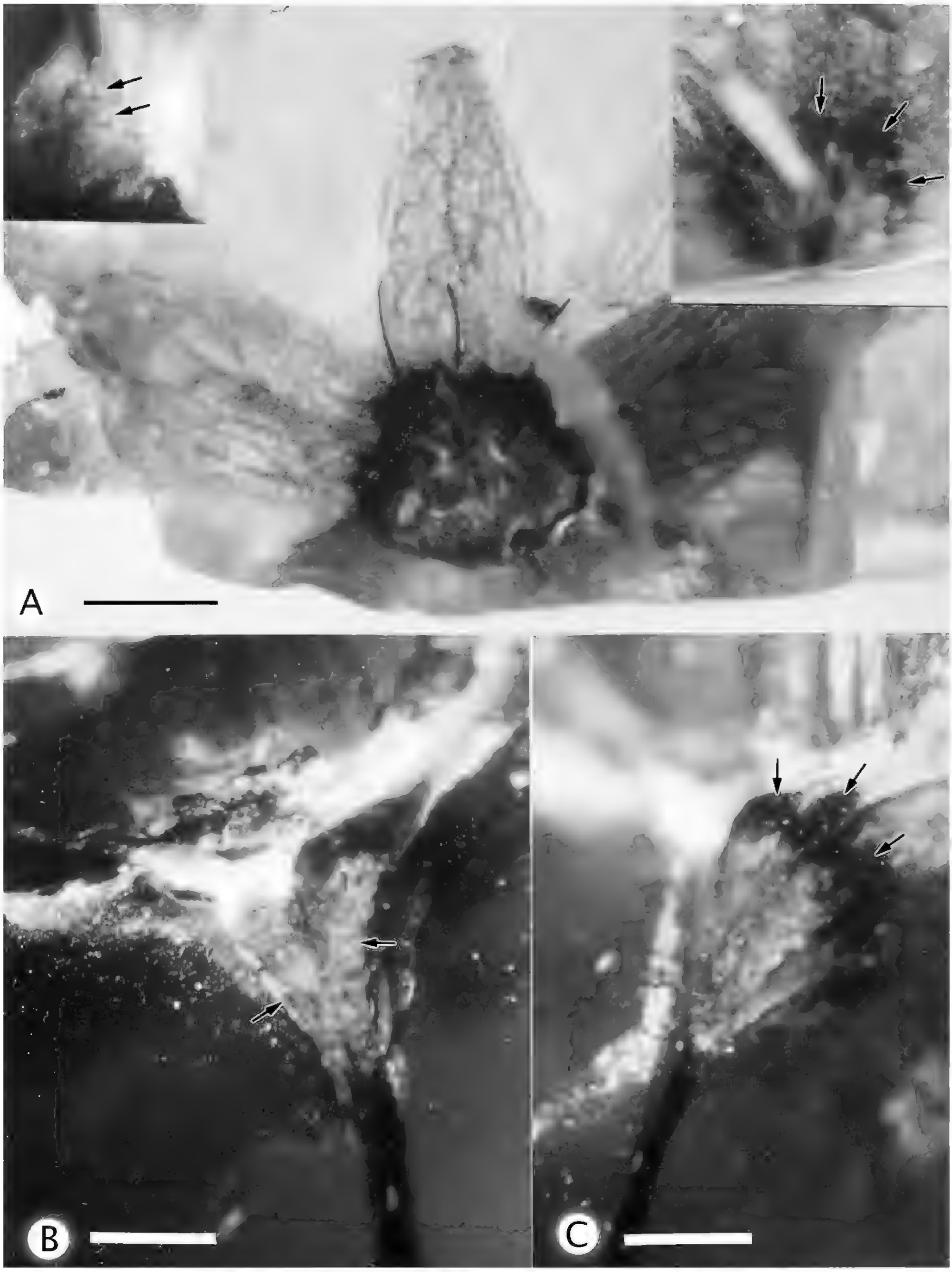

Figure 1. Flower of *Tropidogyne pikei* in Burmese amber. —A. Holotype, T. Pike #ab 14. Right insert shows base of flower (arrows show darkened tissue); left insert shows single remaining anther with pollen (arrows) resting on the dehisced valves. —B. Exterior of ovary showing ridges (arrows). —C. View of darkened tissue (arrows) at distal end of ridges on ovary. Scale bars: A = 0.71 mm; B, C = 0.55 mm.

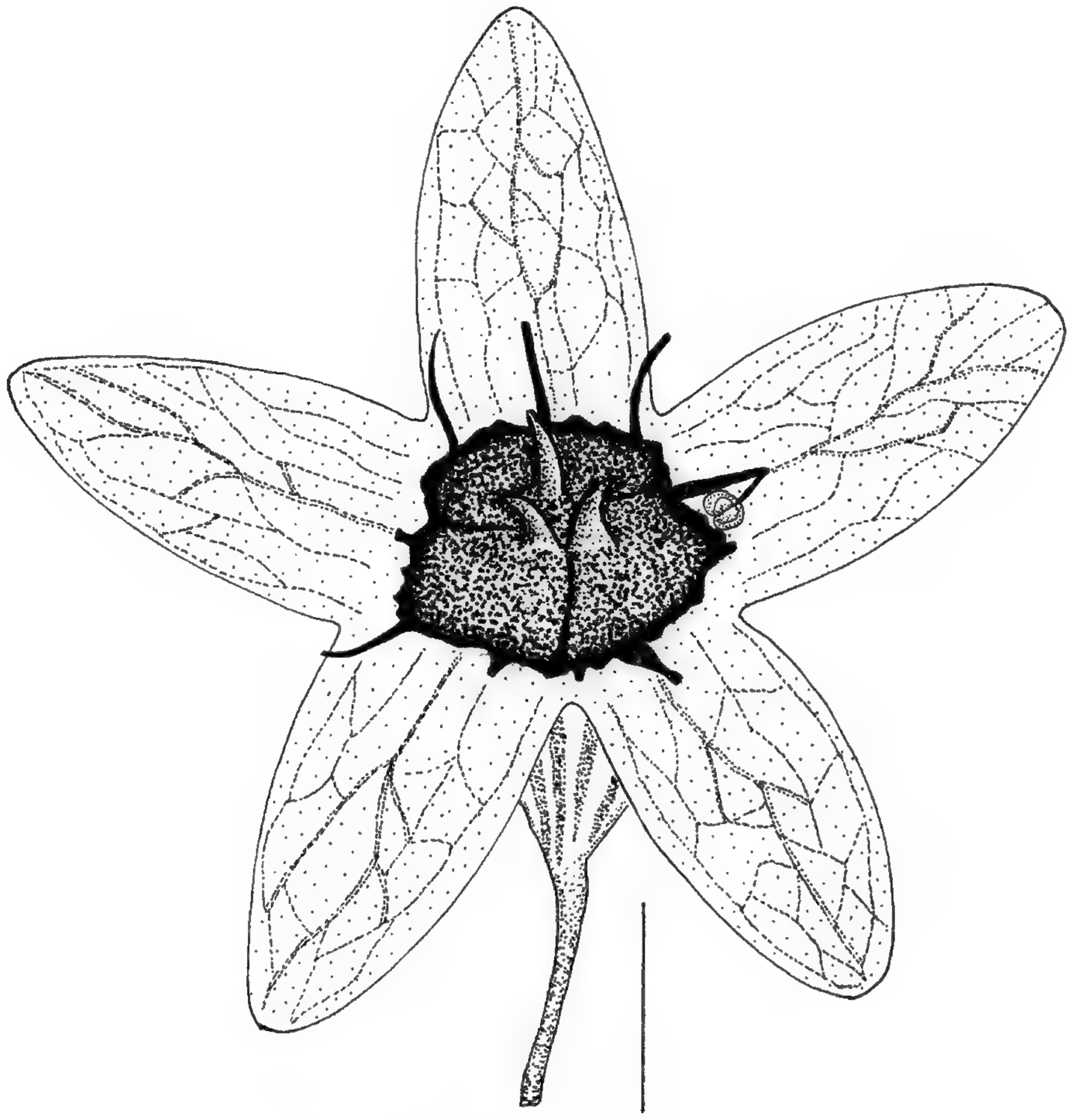

Figure 2. Partial reconstruction of *Tropidogyne pikei*. Scale bar = 1 mm.

†*Tropidogyne*, as described for *C. gummiferum* Sm. (Barnes & Hill, 1999). *Ceratopetalum* sepals are persistent, enlarged, leathery, and assist in dispersal of the dry indehiscent fruits (pseudosamaras, cf. Hopkins & Hoogland, 2002: 76), hence they are well preserved as fossils. †*Tropidogyne* is apetalous, as are eight of the nine species of *Ceratopetalum* (Rozefelds & Barnes, 2002). *Ceratopetalum gummiferum* has five wedge-shaped, 3-toothed petals (Engler, 1930; Matthews et al., 2001: 445, fig. 8). The related genus *Schizomeria* D. Don (Cunoniaceae) differs from the above two genera in being hypogynous (Bradford & Barnes, 2001).

The androecium of both †*Tropidogyne* and *Ceratopetalum* is diplostemonous, with subulate filaments and small, bithecal anthers (Dickison, 1989: 55, fig. 4.2 F; Rozefelds & Barnes, 2002: 658, fig. 5). The remaining anther of the fossil described herein (Fig. 1A, left insert) shows unifacial dehiscence by slits, which very much resembles the introrse anthers of, e.g., *C. tetrapterum* Mattf. (Rozefelds & Barnes, 2002: 659, fig. 6J and other anthers there illustrated). Our interpretation of introrse dehiscence for the fossil is based on this similarity to the modern genus.

The gynoecium of *Ceratopetalum* is consistently bicarpellate (Hopkins & Hoogland, 2002; Bradford et al., 2004), but the tricarpellate condition of †*Tropidogyne* is found as a variation in *Schizomeria* (Hopkins & Hoogland, 2002) as well as elsewhere in Cunoniaceae (Bradford et al., 2004). In both †*Tropidogyne* and *Ceratopetalum* the styles arise separately from a conspicuous epigynous disc and are similar in being short, curved-divergent, and acute (Rozefelds & Barnes, 2002: 658, fig. 5). In both, the stigmas are scarcely defined; Matthews et al. (2001: 448, fig. 34) illustrate the stigma of *C. gummiferum* as a papillate region at the very tip of the style. The ovary of *Ceratopetalum* is described as half-inferior (Hoogland, 1960; Dickison, 1975: 441, fig. 21; Bradford & Barnes, 2001; Bradford et al., 2004), but this is developmentally variable in the genus. For example, in the serial cross sections illustrated by Matthews et al. (2001: 442, fig. 4) for a flower bud of *C. gummiferum*, the locules and ovules in the ovary are located below the level of attachment of the sepals to the receptacle, whereas in developing fruits, the ovary comes to be one half or more superior (Chambers, pers. obs.). The ovary of †*Tropidogyne* appears to be entirely inferior, although we were not able to observe the location of locules and ovules. The ridges on the ovary of †*Tropidogyne* are matched in *C. gummiferum* by 10 projecting ribs forming pronounced ridges on the ovary of flowers and developing fruits (Chambers, pers. obs.). This species otherwise differs from

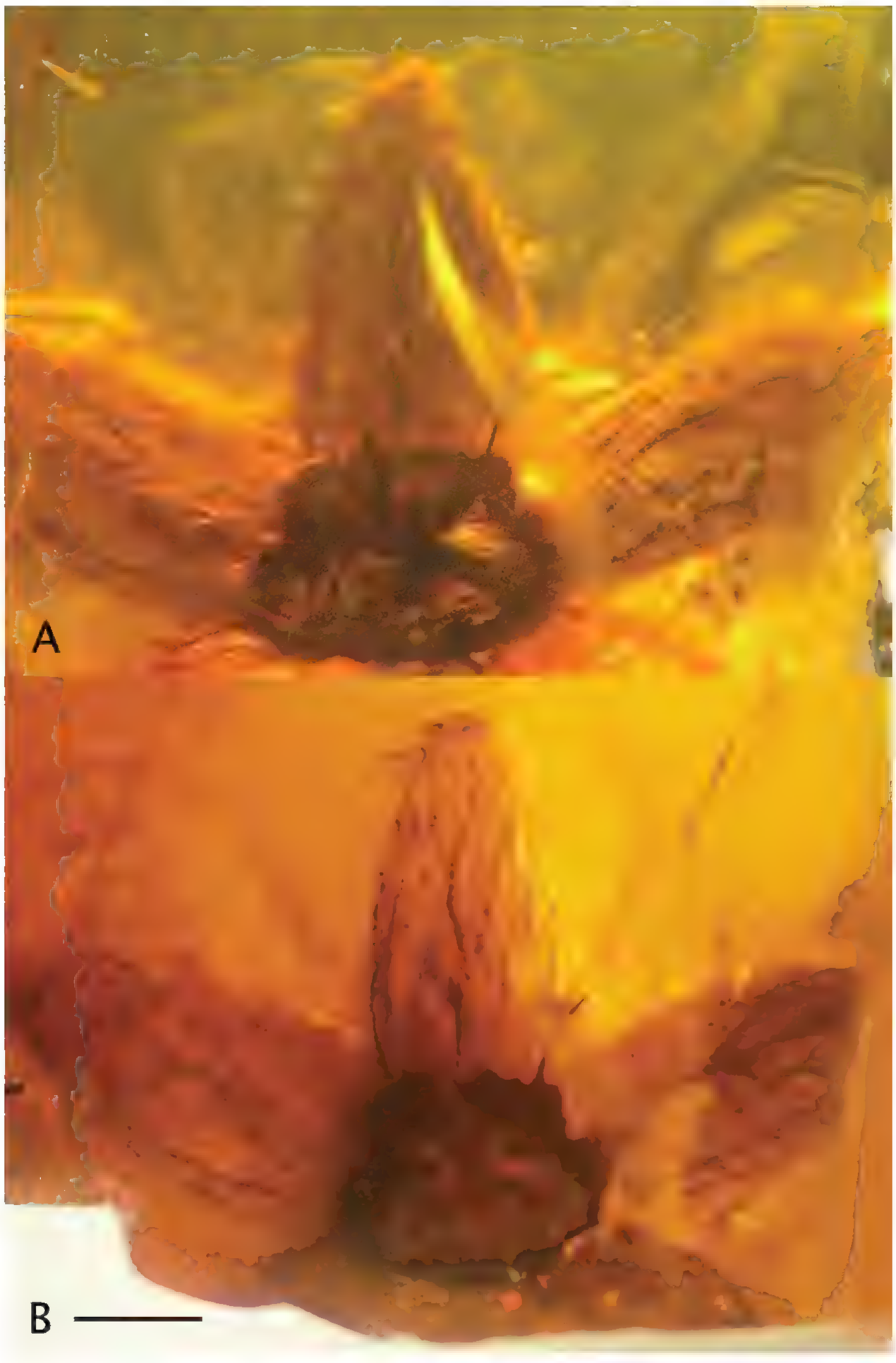

Figure 3. Holotype specimen of *Tropidogyne pikei*. —A. Focal plane showing epigynous disk and styles (photo by R. T. Buckley). —B. Focal plane emphasizing sepal venation (photo by G. O. Poinar). Scale bar = 0.64 mm.

†*Tropidogyne* in having fimbriate petals and a bicarpellate pistil.

The slight basal connation of the sepals of †*Tropidogyne* is not present in *Ceratopetalum*. Further, as best we can determine, the anther of †*Tropidogyne* does not have a prolongation of the thecal connective, as is common in genera of tribe Schizomerieae (Bradford & Barnes, 2001; Rozefelds & Barnes, 2002: 659, fig. 6). However, in some *Ceratopetalum* species the projection can be very small (Rozefelds & Barnes, 2002). Differences are also evident between †*Tropidogyne* and *Ceratopetalum* with respect to the epigynous disc. In the former, the disc is segmented into three lobes representing the three carpels (Fig. 3A), and there is no circumferential ring of swollen tissue as in *Ceratopetalum* (see SEM illustrations in Dickison, 1989: 55, fig. 4 F; Rozefelds & Barnes, 2002: 658, fig. 5). The disc of †*Tropidogyne* is not pubescent around the base of the styles, whereas this is a common feature in *Ceratopetalum*. These various differences between the fossil and the modern genus suggest that the similarities are due to plesiomorphic traits that may not imply a direct phylogenetic link.

The regular occurrence of a gland, or of macerated dark-stained tissue, on each ridge is an evident feature of †*Tropidogyne*. Because of the uncertain nature of these structures, we are not hypothesizing a possible function of such glands.

The charcoalified flower †*Platydiscus peltatus* Schönenberger & Friis, from the Late Cretaceous, has been compared with Cunoniaceae or the structurally similar Anisophylleaceae (Schönenberger et al., 2001). This fossil has been dated to Late Santonian–Early Campanian (80+ Ma). In reconstructions (Friis et al., 2006; Schönenberger & von Balthazar, 2006), it shares features with both †*Tropidogyne* and *Ceratopetalum*

but is 4-merous, tetracarpellate, and petaliferous. There is an annular, lobed disc from which the eight stamens arise, and the ovary is half-inferior. The short, acute, recurved styles (as reconstructed) are reminiscent of †*Tropidogyne* and *Ceratopetalum*. The floral similarities of †*Platydiscus*, *Anisophyllea* R. Br. ex Sabine, and Cunoniaceae, including *Ceratopetalum*, were described by Matthews et al. (2001), who concluded that further study is justified concerning the phylogenetic position of Anisophylleaceae (Cucurbitales, based on *rbcL* phylogeny as noted by Stevens, 2001 on; APG II, 2003). These authors (Matthews et al., 2001; see also Schönenberger & von Balthazar, 2006) question whether the many floral similarities of Anisophylleaceae to Cunoniaceae represent convergent evolution in the Oxalidales and Cucurbitales, or a suite of plesiomorphic features of rosids established in the Late Cretaceous and retained in the two families. We would point out that †*Tropidogyne*, with its similarity to *Ceratopetalum* as well as to †*Platydiscus*, moves the origin of this floral syndrome back to the Early Cretaceous with a probable age of at least 100 Ma.

A review of earlier estimates of the ages of crown and stem groups of basal eudicots (Wilkström et al., 2001; Crepet et al., 2004; Anderson et al., 2005) was provided by Magallón and Castillo (2009). In their analysis, a rapid diversification of eurosid lineages in the last five million years of the Albian was inferred, using molecular methods and known fossil reference points (see also Friis et al., 2006). The present report and other examples of flowers that have recently been described from Burmese amber of the Late Albian (Poinar, 2004; Poinar & Chambers, 2005; Poinar et al., 2007a, 2008) help to document this important segment of eudicot evolution.

†*Tropidogyne* may have been insect-pollinated, as proposed earlier by Santiago-Blay et al. (2005), perhaps being visited by †*Melittosphex burmensis* Poinar & Danforth, a small bee described from the same amber deposits (Poinar & Danforth, 2006).

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Validation of the Name *Parodia lenninghausii* (Cactaceae), with a Note on the Lectotypification and Orthography of the Name

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Abstract. The name *Parodia leninghausii* (F. Haage) F. H. Brandt (Cactaceae) is in common use for a widespread and easily grown plant, but no valid combination has ever been published. The missing combination *P. lenninghausii* (F. Haage) F. H. Brandt ex Eggli & Hofacker is published here, together with the designation of a lectotype and a note on the orthography of the name.

Key words: Cactaceae, *Parodia*.

Parodia leninghausii (F. Haage) F. H. Brandt (Cactaceae) is among the most widely cultivated cacti, both because of its stately appearance and because of its generally easy cultivation. Even though the taxon, which is native to Rio Grande do Sul in southern Brazil, is generally still encountered under the name *Notocactus leninghausii* (K. Schum.) A. Berger, there is substantial agreement (Anderson, 2001, 2005; Hunt et al., 2006) now that *Notocactus* (K. Schum.) Frič is a taxonomic synonym of *Parodia* Speg., and the correct name would therefore be *P. leninghausii*. A recent look at the nomenclatural details showed, however, that this name has so far remained invalid. A short history of the nomenclature and taxonomy of the taxon, presented here, elucidates the reasons for this omission and stresses the importance of a careful interpretation of the original sources for basionym and combinations. This evaluation also shows that the customary spelling "*leninghausii*" is erroneous and must be corrected to "*lenninghausii*."

Outline of the Nomenclatural History

The taxon is mentioned for the first time as *Pilocereus leninghausii* (note spelling) (nom. inval., *International Code of Botanical Nomenclature* [ICBN], Art. 32.1d; nom. incorr., Art. 11.4; McNeill et al., 2006) by Schumann (1895: 147), ascribing the name to F. Haage. In the same paragraph, Schumann suspects that it is a species of *Echinocactus* Link & Otto and uses the provisional name *E. leninghausii* (note spelling) (nom. inval., Art. 34.1b; McNeill et al., 2006). The name "*Echinocactus leninghausii* K. Schumann" was again used (Schumann in Hirscht, 1895: 189) in a report of a meeting of the German Cactus Society, but without descriptive matter.

In the following year, the name *Pilocereus lenninghausii* (note spelling) "Haage jr." was published with a short but unambiguously acceptable diagnosis, accompanied by an illustration, in the German edition of the 1896 catalogue of the world-renowned nursery of Friedrich Adolph Haage Jr., Erfurt, Germany (Haage, 1896: 14). This is the first valid publication of the name, which is properly cited as *Pilocereus lenninghausii* F. Haage, even though it is incorrect under Article 11.4 (McNeill et al., 2006) since *Pilocereus* K. Schum. (Schumann, 1894) (established indirectly by including the type of the *Pilocereus* Lem. [Lemaire, 1839]) is illegitimate (Art. 53.1) versus *Pilocereus* Lem. (Lemaire, 1839), which is itself illegitimate (Art. 52.1) versus *Cephalocereus* Pfeiff. (Pfeiffer, 1838) (Index Nominorum Genericorum, accessed May 2008 at <http://botany.si.edu/ing/ingForm.cfm>).

In 1897, the name *Pilocereus lenninghausii* (note spelling) "Haage jr." also appears with a short but unambiguously acceptable diagnosis, and with the same illustration as 1896, in the English edition of a Haage catalogue (Haage, 1897a: 25). The name (with the same spelling) and illustration (but not the description) also appear in the German edition of this catalogue (Haage, 1897b).

In 1898, the name *Echinocactus leninghausii* (note spelling) K. Schum. is used by Schumann (1897–1898: 382–383), referring to the 1895 note published by Schumann (Schumann, 1895), and an (unspecified) catalogue of "Ferd. Haage sen." *Echinocactus leninghausii* could either be interpreted as the name of a new taxon (the name is attributed to K. Schumann, and is accompanied by a Latin diagnosis and German description), or (under Art. 33.2; McNeill et al., 2006) as combination for *Pilocereus leninghausii* F. Haage

(Haage, 1896). Unfortunately, Schumann (1897–1898) did not make a typographical distinction between new taxa (e.g., *Echinocactus chrysacanthion* K. Schum. [Schumann, 1897–1898: 396–397]) and names published previously, or combinations for such names. The only hint in these latter cases are the references cited after the German description. On the basis of these references, we can safely conclude that the name was intended as combination. The correct citation is, therefore, *Echinocactus lenninghausii* (F. Haage) K. Schum. (as "*leninghausii*"), Gesamtbeschr. Kakt., 382–383, 1898 (basionym: *Pilocereus lenninghausii* F. Haage, 1896). IPNI (accessed April 2009 at <http://www.ipni.org/ipni/plantnamesearchpage.do>) incorrectly attributes the name to Schumann (1900: 134).

Subsequently, combinations were published as *Malacocarpus lenninghausii* (F. Haage) Britton & Rose (as "*leninghausii*") (Britton & Rose, 1922), *Notocactus lenninghausii* (F. Haage) A. Berger (as "*leninghausii*") (Berger, 1929), *Eriocephala lenninghausii* (F. Haage) Heinrich (Heinrich, 1940) (combination attributed to Backeberg, but Art. 46.4 applies; McNeill et al., 2006), and *Eriocactus lenninghausii* (F. Haage) Backeb. (Backeberg, 1942) (nom. incorr., Art. 11.4, because *Eriocactus* Backeb. is an unnecessary illegitimate nomen novum [Art. 52.1] for *Eriocephala* Backeb.).

Finally, Brandt (1982: 61) published the combination *Parodia lenninghausii* "(F. Hge.) Brandt comb. nov." (as "*leninghausii*"), citing the 1895 nomen nudum "*Pilocereus leninghausii* F. Haage Cat. K. Sch. in Monatsschrift für Kakteenkunde, 5: 147." This is obviously not the correct reference to the basionym name, and the combination at first glance can be dismissed under ICBN Article 33.4 (McNeill et al., 2006). Article 33.5 does not apply, but the provisions of Article 33.7 need to be evaluated carefully: 33.7(a) does not apply, as the name was validly published later than the reference given, and in a different publication; 33.7(b) and (c) do not apply; 33.7(d) is more complicated, as Brandt also cites "*Notocactus leninghausii* (F. Hge.) Buxb., Krainz, Die Kakteen 1.I.1967." This relates to the entry on *Notocactus leninghausii* "(F. Haage jun.) Berger" in H. Krainz's serial publication *Die Kakteen*. The reference, though, is erroneous, and the entry on *Notocactus leninghausii* was actually published in the part issued 1 July 1968. Since Krainz (1968) reproduces a Latin diagnosis copied from Schumann (1897–1898), and since the erroneous citation can be treated as a correctable error, Article 33.7(d) seems to be applicable. On closer scrutiny, however, not all conditions for the valid publication of a new name are fulfilled since no type

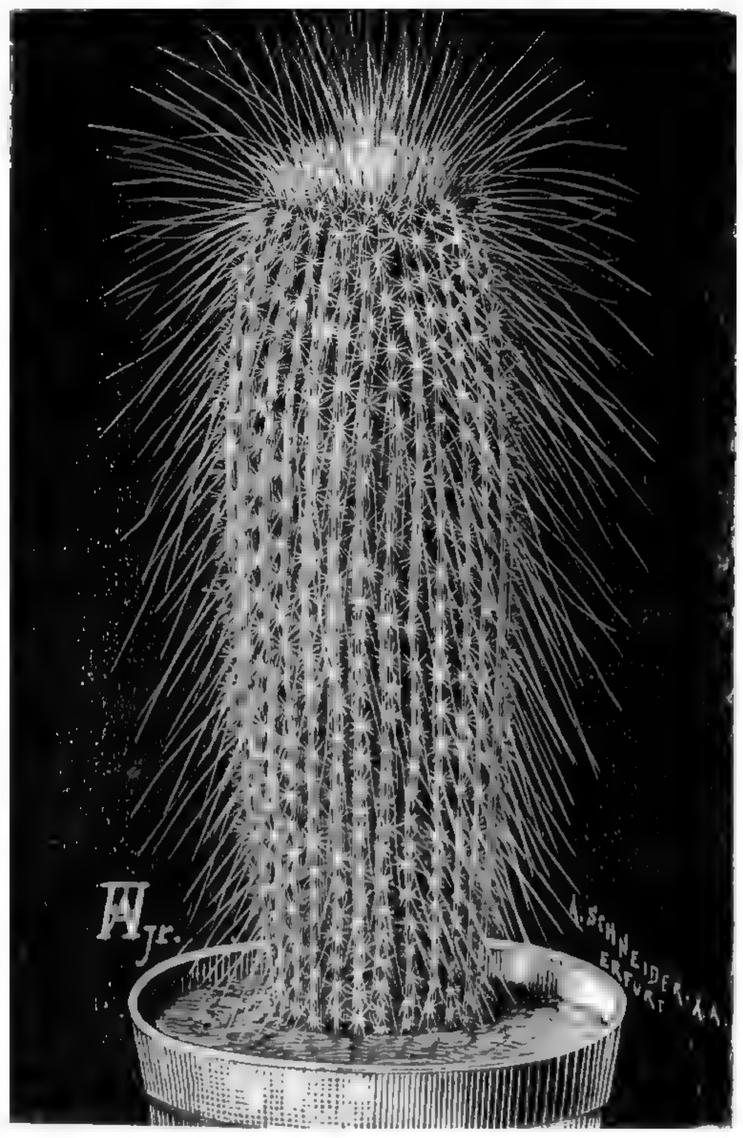

Figure 1. Reproduction of the illustration that accompanied the protologue of *Pilocereus lenninghausii* F. Haage (reproduced from Schelle, 1907: 178).

is indicated in the 1968 publication, and thus Brandt's 1982 combination is not validly published. As a consequence, there is no valid combination available under *Parodia*, which is remedied here.

Parodia lenninghausii (F. Haage) F. H. Brandt ex Eggli & Hofacker, comb. nov. Basionym: *Pilocereus lenninghausii* F. Haage, 73. Jahrgang. Verzeichniss über Blumenzwiebeln und Knollengewächse nebst...sowie Auszug neuer und empfehlenswerther Cacteen, 1896: 14, cum fig. TYPE: F. Haage, 1896: 14, right-hand column, figure labelled "Lenninghausii Haage jr." (lectotype, designated here, fig. in F. Haage, 1896).

The illustration designated here as lectotype is technically (but not formally) identical with the one that Hunt and Taylor (2006) have previously selected as lectotype. Unfortunately, these authors did not state which catalogue edition they referred to, although the page reference they give seems to point to the English edition. The "type element" is thus not clearly indicated by direct citation (McNeill et al., 2006: Art. 7.11), and the Hunt and Taylor lectotypification was therefore not validly published. A reproduction of the illustration can be found in Schelle (1907: 178). The drawing (woodcut) leaves nothing to be desired as to clarity, and no epitype is necessary to fix the application of the name (Fig. 1).

A Note on the Spelling of the Specific Epithet

In all current literature, the spelling "*leninghausii*" is used, while the protologue as well as subsequent Haage catalogues (as well as Heinrich [1940] and Backeberg [1942]) consistently used the spelling "*lenninghausii*." This spelling has to be retained under Article 60.1 (McNeill et al., 2006), as there is no evidence that a typographical or orthographical error has been made. The epithet is not explained in the protologue, and the only available information was provided by Haage (1981). He believes that the epithet honors "Fred. Guillermo Lenninghaus," a cactus collector in Porto Alegre, Brazil, who in 1894 sent plants to the Haage nursery at Erfurt.

It could be argued that the spelling "*leninghausii*," being established by current use, and not having been recently questioned, should be retained for the sake of nomenclatural stability. Since the change only affects the fourth letter of the epithet, the possible confusion associated with the change from current use to the original spelling is not insurmountable. If the continued usage of the customary, but erroneous, spelling is deemed more appropriate, a formal proposal to conserve (McNeill et al., 2006: Art. 14.11) will be needed.

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New Combinations in *Habranthus* (Amaryllidaceae) in Mexico and Southwestern U.S.A.

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Abstract. New combinations in *Habranthus* Herb. (Amaryllidaceae) are made for four species that were previously treated as *Zephyranthes* Herb. (*Z. arenicola* Brandegee, *Z. chichimeca* T. M. Howard & S. Ogden, *Z. conzattii* Greenm., and *Z. longifolia* Hemsl.) and that are endemic to Mexico and the southwestern United States: *H. arenicola* (Brandegee) Flagg, G. Lom. Sm. & Meerow, *H. chichimeca* (T. M. Howard & S. Ogden) Flagg, G. Lom. Sm. & Meerow, *H. conzattii* (Greenm.) Flagg, G. Lom. Sm. & Meerow, and *H. longifolius* (Hemsl.) Flagg, G. Lom. Sm. & Meerow. The mature anthers, which are more or less horizontal and usually lunate or U-shaped, readily distinguish *Habranthus* from *Zephyranthes*, in which the mature anthers are vertical and relatively linear.

Key words: Amaryllidaceae, *Habranthus*, Mexico, southwestern United States, *Zephyranthes*.

In reviewing specimens of *Habranthus* Herb. and *Zephyranthes* Herb. (Amaryllidaceae) in Mexico and the southwestern United States, we found four species treated as *Zephyranthes* that we are transferring to *Habranthus*. *Habranthus* and *Zephyranthes* are closely allied genera—both bearing the same common name, rain-lilies. Mature anthers, which are more or less horizontal and usually lunate or U-shaped, readily distinguish *Habranthus* from *Zephyranthes*, in which the mature anthers are relatively vertical and linear. Other characteristics distinguishing Mexican members of the two genera are more readily observed in living plants than in herbarium specimens. Flowers of *Habranthus* tend to be nodding with stamens at three or four distinct levels; flowers of *Zephyranthes* tend to be erect to suberect with stamens at two levels with varying degrees of overlapping to non-overlapping of the anthers. Another floral characteristic that has proven useful in separating taxa of *Zephyranthes* and *Habranthus* is the shape of the young ovary. It is cylindrical, broader at the apex tapering slightly to the base in taxa of *Habranthus*. In contrast, the young ovary is subglobose to globose in taxa of *Zephyranthes*. A notable exception is that in certain *Zephyranthes* taxa, which have at various times been treated in the genus *Cooperia* Herb., the young ovary is cylindrical but not broader at the apex and not tapering slightly to the base (Flagg et al., 2002a, b).

This generic distinction is supported by nuclear ribosomal DNA (nrDNA) ITS sequences studies by Meerow et al. (2000). In Figure 1 of their paper, there is a monophyletic clade that, when carefully evaluated, is determined to be all *Habranthus* taxa as defined by the criteria outlined above. These findings suggest *Habranthus* as a monophyletic group, although the four combinations made here were not part of that study.

1. Habranthus arenicola (Brandegee) Flagg, G. Lom. Sm. & Meerow, comb. nov. Basionym: *Zephyranthes arenicola* Brandegee, Proc. Calif. Acad. Sci., ser. 2, 2: 205. 1889. *Atamosco arenicola* (Brandegee) Greene, Pittonia 3: 187. 1897. TYPE: Mexico. Baja California: Santa Margarita Island, 2 Mar. 1889, *T. S. Brandegee s.n.* (lectotype, designated here, UC).

Note. For the lectotype we selected the only Brandegee collection cited in the protologue that had a flower.

Selected specimens examined. MEXICO. **Baja California:** Magdalena Bay, 15 Jan. 1889, *T. S. Brandegee s.n.*

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(syntype, UC); Guadalupe, 17 Jan. 1890, *T. S. Brandegee s.n.* (UC); head of S branch of Canada de Teojo, vic. of Portezuelo de Peloteado, *A. Carter 4655* (UC); peaks S of Portezuelo de la Cuesta de los Dolores, *A. Carter 4770* (UC); Mesa de San Geronimo, N from Rancho Viejo, *A. Carter 5018* (UC); Turtle Inlet, Magdalena Bay, "type region," *J. T. Howell 10650* (GH); upper slopes, arroyo S of Marquer Bay, Carmen Is., *R. Moran 9195* (MO).

2. Habranthus chichimeca (T. M. Howard & S. Ogden) Flagg, G. Lom. Sm. & Meerow, comb. nov. Basionym: *Zephyranthes chichimeca* T. M. Howard & S. Ogden, Herbertia 46(2): 105–106. 1990 [1991]. TYPE: Mexico. Nuevo León: ca. 25 mi. N of Matehuala, San Luis Potosí, near state line of Nuevo León & San Luis Potosí, June 1986, *T. M. Howard & S. Ogden 86-44* (holotype, MO).

Selected specimens examined. MEXICO. **Nuevo León:** Mpio. Zaragoza Camino de la Encantada a la Tinhaja, *L. Hernandez et al. 2760* (TEX). **San Luis Potosí:** ca. 2 km NE of Estación Vanegus, *M. C. Johnston et al. 11095* (TEX). **Tamaulipas:** 38.8 km (24 mi.) N of Tula on 70 before turnoff to Bustamante, *Cowan et al. 3863* (TEX). **Zacatecas:** high desert, 4 mi. SE of Fresnillo, *Waterfall & Wallis 13823* (TEX).

3. Habranthus conzattii (Greenm.) Flagg, G. Lom. Sm. & Meerow, comb. nov. Basionym: *Zephyranthes conzattii* Greenm., Proc. Amer. Acad. Arts 33: 473. 1898. TYPE: Mexico. Oaxaca: Valley of Oaxaca, 1500 m, 19 Apr. 1896, *C. Conzatti 98* (holotype, GH).

Habranthus oaxacanus T. M. Howard, Herbertia 51: 43–44. 1996, syn. nov. TYPE: Mexico. Oaxaca: 5 km S of Guelatao on Mexico 175, 3000 m, 30 July 1992, *T. M. Howard 92-4* (holotype, MO).

Note. Measurements, observations, and location clearly indicate to us that *Habranthus oaxacanus* is the same taxon as *H. conzattii*.

4. Habranthus longifolius (Hemsl.) Flagg, G. Lom. Sm. & Meerow, comb. nov. Basionym: *Zephyranthes longifolia* Hemsl., Diagn. Pl. Nov. Mexic., Pt. 3, 55, 1880, non *Z. longifolia* Arechav., 1899. *Atamosco longifolia* (Hemsl.) Cockerell, Canad. Entomol. 33: 283. 1901. TYPE: U.S.A. New Mexico: 1851–52, *C. Wright 1904* (lectotype, designated here, K; isotypes, GH, MO, UC, US).

Notes. We selected *C. Wright 1904* as the lectotype for *Habranthus longifolius* because it is the first specimen Hemsley cited in the protologue, and Kew is identified as the herbarium in the protologue. The second specimen cited by Hemsley is *Perry & Palmer 870*.

Although *Zephyranthes aurea* S. Watson (Proc. Amer. Acad. Arts 18: 161. 1883) is a valid name, it is illegitimate because two of its eight syntypes are types of *Z. longifolia* Hemsl.: *C. Wright 1904* and *C. C. Parry & E. Palmer 870* (cf. McNeill et al., 2006: Art. 52; K. Gandhi, pers. comm.).

Selected specimens examined. MEXICO. **Baja California:** San Gorge, *H. S. Gentry 4173* (ARIZ, GH, MO). **Chihuahua:** SW of Chihuahua, *H. LeSueur* 568 (ARIZ, F, MO, TEX, UC). **Coahuila:** valley near Azufrora not far from Saltillo, *J. Gregg 491* (GH, MO); Saltillo, *E. Palmer 219* (C, F, GH, MO, NY, UC). **San Luis Potosí:** 22°N lat., *C. C. Parry & E. Palmer 870* (syntype, K; isosyntypes, GH, MO, NY); ex convalli San Luis Potosí, *J. G. Schaffner 540* (GH, K). **Zacatecas:** Cedros Hills, *F. E. Lloyd 124* (GH). U.S.A. **Arizona:** Cochise Co.?, near Ft. Huachuca, *J. G. Lemmon 2892* (GH, UC); Pima Co., 10 mi. SE of Tucson, *Goodman & Hitchcock 1241* (F, GH, MO, NY, UC). **New Mexico:** Dona Ana Co., mesa near Las Cruces, *E. O. Wooten 141* (GH, MO, NY, UC); Grant Co., near Silver City, *E. L. Greene 455* (GH). **Texas:** Jeff Davis Co., Ft. Davis, 1880, *J. B. Girard s.n.* (GH); Davis Mtns., Goat Canyon, Jones Ranch, 16 July 1936, *L. C. Hinckley s.n.* (ARIZ, GH, NY).

Acknowledgments. We thank Andrew S. Doran (UC) for photocopies of the original description of *Zephyranthes arenicola* Brandegee and a digital image loan, Tom Wendt (TEX, LL) for a prolonged critical loan, Jim Solomon (MO) for extra efforts in locating the types of Howard and authorizing a loan of these types, and Kanchi Gandhi (GH) for nomenclatural assistance in the clarification of the status of *Z. aurea* S. Watson.

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A New Species of *Zornia* (Leguminosae, Papilionoideae) from Northeastern Brazil

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Abstract. *Zornia grandiflora* Fort.-Perez & A. M. G. Azevedo (Leguminosae, Papilionoideae), a new species from Bahia and Pernambuco states in northeastern Brazil, is described and illustrated. The new species is assigned to section *Anisophylla* Mohlenbr. of subgenus *Zornia* J. F. Gmel. *Zornia grandiflora* is similar to *Z. sericea* Moric., sharing erect stems and ovate to elliptic bracteoles. It can be distinguished from *Z. sericea* and from other species within *Zornia* sect. *Anisophylla* by the large standard (13–17 mm long).

Resumo. *Zornia grandiflora* Fort.-Perez & A. M. G. Azevedo (Leguminosae, Papilionoideae), uma nova espécie do nordeste do Brasil (estados da Bahia e Pernambuco), é descrita e ilustrada. Esta nova espécie pertence à seção *Anisophylla* Mohlenbr. do subgênero *Zornia* J. F. Gmel. *Zornia grandiflora* possui afinidades com *Z. sericea* Moric., compartilhando os ramos eretos e as bractéolas ovais a elípticas; e pode ser separada desta e das outras espécies de *Zornia* sect. *Anisophylla* pelo expressivo tamanho do estandarte (13–17 mm comprimento).

Key words: Bahia, Brazil, IUCN Red List, Leguminosae, Pernambuco, *Zornia* sect. *Anisophylla*.

The genus *Zornia* J. F. Gmel. (Leguminosae, Papilionoideae) comprises about 75 to 80 species from the tropics and subtropics (Mohlenbrock, 1961; Rudd, 1981; Klitgaard & Lavin, 2005), and ca. 36 species are estimated from Brazil. According to a molecular study carried out by Lavin et al. (2001), the genus has been included in the *Adesmia* DC. clade of tribe Dalbergieae s.l.

Species of *Zornia* share several morphological characters: each flower is surrounded by a pair of peltate bracteoles similar to the stipules, the leaves are 2- or 4-foliolate, and the stems frequently are diffusely branched and woody at the base. The size and form of the bracteoles (bracts) are important characters for the delimitation of the taxa, mainly in section *Anisophylla* Mohlenbr. of subgenus *Zornia*, according to the classification proposed by Mohlenbrock (1961). The concept of the bracteoles used in this paper is in accordance with that of Tucker (1987), in which they are referred to as homologous to the paired prophylls of each vegetative axillary bud. According to Tucker (1987), the prophylls are opposite and paired in most dicotyledons and are the first products of the axillary vegetative apex. In *Zornia*, as well as other species of dalbergioid genera, each flower is subtended by a pair of bracteoles, with the flowers of *Zornia* sessile instead of pedicellate as in *Ormocarpum* P. Beauv. and *Discolobium* Benth. (Sciamarelli, 1994).

During surveys of herbarium collections for a revision of *Zornia* in Brazil, a new species was found, which is described and illustrated from herbarium specimens located at HUEFS, K, and PEUFR. Another Brazilian species of *Zornia* has recently been described from Minas Gerais State as *Z. subsessilis* Fort.-Perez & A. M. G. Azevedo (Fortuna-Perez & Tozzi, 2008). In contrast, the new taxon is known to occur only in northeastern Brazil.

Zornia grandiflora Fort.-Perez & A. M. G. Azevedo, sp. nov. TYPE: Brazil. Pernambuco: Buíque, estrada para Catimbau, 10 July 1997, *A. M. Frazão et al. s.n.* (holotype, HUEFS 38032; isotype, PEUFR 6809). Figure 1.

Haec species quoad caules erectos etiam bracteolas ovatas usque ellipticas *Zorniae sericeae* Moric. similis, sed ab ea bracteolis glabris, vexillo magno 13–17 mm longo atque lomento 5- vel 6-articulato articulis ca. 2 mm longis differt.

Subshrub ca. 0.7 m tall, stems erect, villous, punctate. Stipules 5–7 × 2–3 mm, lanceolate, peltate, punctate, glabrous; leaves with 2 leaflets, punctate; lower leaflets 15–40 × 5–25 mm, ovate to lanceolate, apex acute, base obtusely asymmetrical, margin ciliate, abaxial surface sericeous, adaxial surface sparsely sericeous; upper leaflets 10–40 × 5–15 mm, lanceolate, apex acute, mucronate, base obtusely asymmetrical, margin ciliate, abaxial surface sericeous, adaxial surface sparsely sericeous. Bracteoles to 7–16 × 4–7 mm, ovate to elliptic, glabrous to

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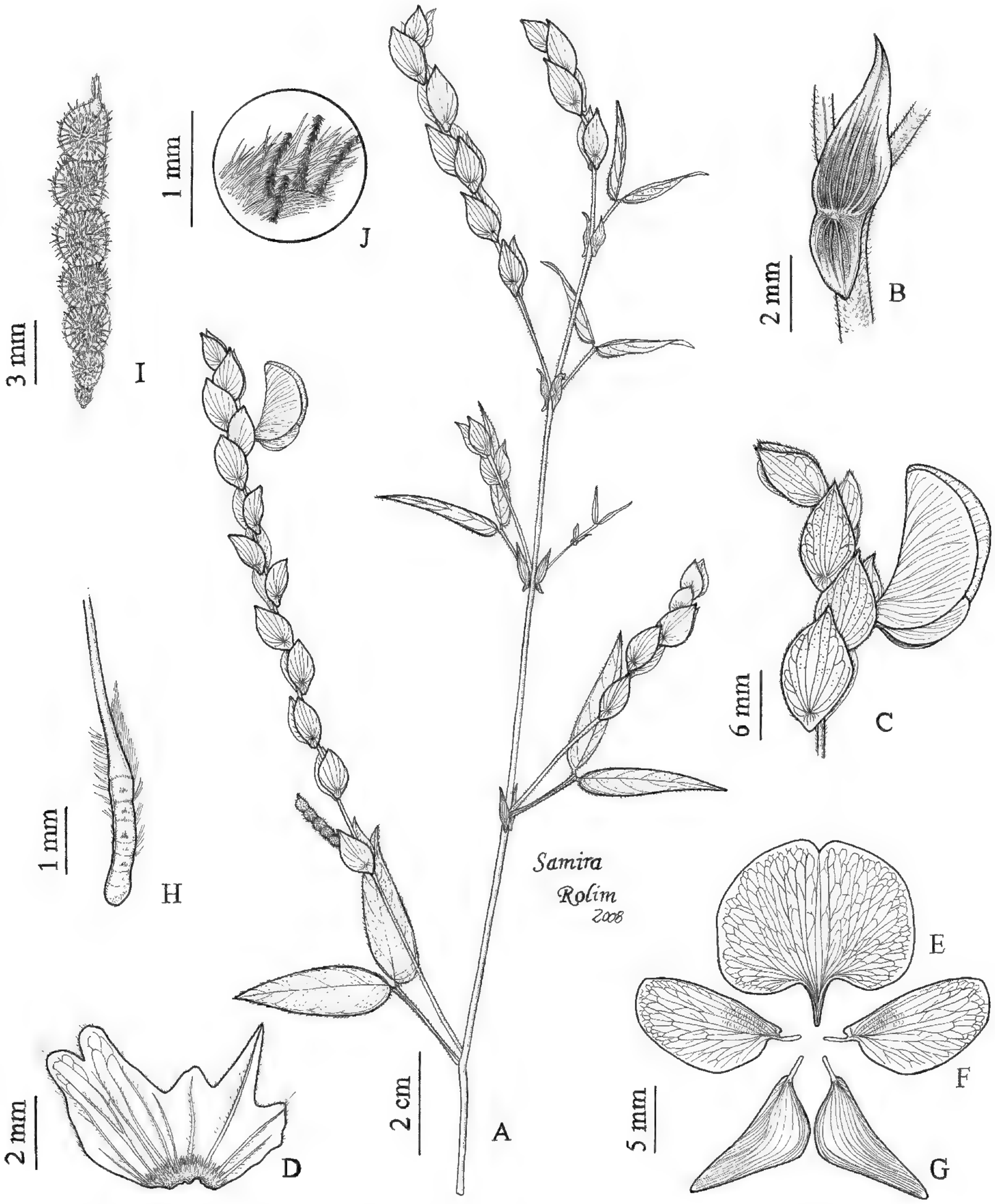

Figure 1. *Zornia grandiflora* Fort.-Perez & A. M. G. Azevedo. —A. Flowering and fruiting branch. —B. Detail of the stipule. —C. Partial inflorescence with bracteoles and flowers. —D. Calyx. —E. Standard. —F. Wings. —G. Keel petals. —H. Pistil. —I. Fruit (loment). —J. Detail of loment surface with bristles. A–H based on the holotype *Frazão et al. s.n.* (HUEFS); I, J based on the paratype *Andrade et al. 61* (PEUFR).

glabrescent, margin ciliate, punctate, 7- to 9-nerved; auricle ca. 5 mm, punctate; inflorescence spiciform, terminal or axillary, 3–19 cm, villous. Calyx campanulate, 5-lobed, glabrous to pubescent, margin ciliate, 7- to 10-nerved, standard 13–17 × 13–16 mm, orbicular, apex retuse, base subauriculate, glabrous; claw 2–4 mm; wing petals 7–11 × ca. 5 mm, ovate, apex rounded, glabrous; keel petals 7–12 × 4–5 mm, as long as the wing petals, falcate, apex acute, glabrous; stamens 10–13 mm, dimorphic; ovary pilose; style curved, stigma minute. Fruit a loment with 5 or 6 articulations; each article ca. 2 × 1.5–1.8 mm, sericeous, reticulate, bristly, bristles to 0.5–1 mm; seeds ca. 2 × 1.5 mm, yellowish green, smooth.

Distribution and habitat. *Zornia grandiflora* occurs in Bahia (Gentio do Ouro municipality) and Pernambuco (Buíque municipality) states, Brazil, growing in caatinga vegetation on sandy soil.

IUCN Red List category. According to IUCN Red List criteria (IUCN, 2001), the conservation status of *Zornia grandiflora* must be considered Data Deficient (DD) because it is known only from a few collections.

Table 1. Morphological comparison of *Zornia grandiflora* and related species.

	Z. grandiflora	*Z. sericea*	*Z. reticulata*
Length of standard (mm)	13–17	7–10	5–11
Length of bracteoles (mm)	7–16	8–15	11–15
Form of bracteoles	ovate to elliptic	ovate	lanceolate
Length of auricle at bracteole (mm)	ca. 5	0–3	6–10
No. of articles per loment	5 to 6	3 to 4	5 to 10
Length of articles (mm)	ca. 2	3–4	1.5–2.5

Phenology. The known collections (in flower and fruit) of the new species were collected from May to July.

Etymology. The epithet *grandiflora* refers to the large standard of the flower, which surpasses those of any other species of *Zornia* sect. *Anisophylla*.

Discussion. *Zornia grandiflora* belongs to section *Anisophylla* of subgenus *Zornia*, on the basis of the leaflets of the lower leaves that are always different in form from those of the upper leaflets in any one plant. However, the new species is distinguished from all other species of *Zornia* sect. *Anisophylla* by the large standard of the flower, ranging from 13–17 mm long. The range of standard lengths in other species of *Zornia* sect. *Anisophylla* does not exceed 13 mm long. The new species is morphologically similar to *Z. sericea* Moric., sharing the erect stems and ovate to elliptic bracteoles. *Zornia sericea* has, however, sericeous bracteoles, with only a minute auricle at the bracteole base, a floral standard only to 10 mm long, the articles of loment are longer (to at least 3 mm), and the fruit has fewer articulations (only four). *Zornia sericea* also occurs in caatinga vegetation from northeastern Brazil, growing mainly on sandy grounds. It is also cited for Argentina, Bolivia, and Venezuela (Mohlenbrock, 1961). *Zornia reticulata* Sm. also resembles *Z. grandiflora*; however, it has a floral standard up to 11 mm long and lanceolate bracteoles. *Zornia reticulata* is widely distributed in South America, growing mainly in disturbed environments. Morphological characters for the comparison of *Z. grandiflora* with related species are shown in Table 1.

Paratypes. BRAZIL. **Bahia:** Gentio do Ouro, *R. M. Harley 18978* (K). **Pernambuco:** Buíque, Fazenda Laranjeiras, *K. Andrade, E. Inácio & A. Laurênio 61* (PEUFR), *A. P. S. Gomes, A. Laurênio, K. Andrade & M. J. N. Rodal 20* (PEUFR); Serra do Catimbau, *A. M. Miranda, L. P. Félix & S. C. Rodrigues 1732* (HUEFS), *Z. Travassos 228* (K), *Z. Travassos 212* (K), *E. Menezes 27* (K), *M. B. Costa e Silva 252* (K).

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Taxonomy of *Basicladia* (Cladophorales, Chlorophyta) with Two New Combinations

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Abstract. The green algal genus *Basicladia* W. E. Hoffman & Tilden suggested for synonymy in *Cladophora* Kütz. by van den Hoek is reconfirmed as a genus based on the distinct basal system and the primarily epizoic habit associated with freshwater turtles. Previously assigned to *Cladophora* sect. *Basicladia* (W. E. Hoffmann & Tilden) C. Hoek, *C. kosterae* C. Hoek (type: France) and *C. okamurae* (S. Ueda) C. Hoek (type: Japan) transfer to *Basicladia*, based on morphology and molecular evidence. The two new combinations *B. kosterae* (C. Hoek) Garbary and *B. okamurae* (S. Ueda) Garbary bring the number of species in *Basicladia* to seven.

Key words: *Basicladia*, *Cladophora*, Cladophorales, turtle algae.

The cladophoroid genus *Basicladia* W. E. Hoffmann & Tilden (Hoffmann & Tilden, 1930) was initially described for two species of epizoic algae on the shells of freshwater turtles. Further species were added, all of which were either epizoic on turtles or occurred on a freshwater snail. Five species have now been assigned to the genus: *B. crassa* W. E. Hoffmann & Tilden (generitype), *B. chelonum* (Collins) W. E. Hoffmann & Tilden, *B. ramulosa* Ducker (Ducker, 1958), *B. sinensis* (N. L. Gardner) G. M. Sm. (Smith, 1950), and *B. vivipara* Normandin & Taft (Normandin & Taft, 1959). The genus *Basicladia* is widely distributed in freshwater habitats where turtles are present (e.g., Yoneda, 1952; Ducker, 1958; Prasad & Jain, 1973; Ernst & Norris, 1978; Garbary et al., 2007).

In his monograph of European *Cladophora* Kütz., van den Hoek (1963) considered *Basicladia* as a synonym of *Cladophora* and reduced *Basicladia* to sectional status within the genus. However, he incorrectly designated *B. chelonum* as the type, and none of the five existing species of *Basicladia* were formally transferred into *Cladophora*. A new species of *Cladophora*, *C. kosterae* C. Hoek, was described, and *Chaetomorpha okamurae* S. Ueda was formally transferred to *Cladophora* as *C. okamurae* (S. Ueda) C. Hoek. Van den Hoek (1963) left us with several taxonomic and nomenclatural issues. First, the type of *Cladophora* sect. *Basicladia* was not assigned to *Cladophora*. Furthermore, if *Basicladia* was distinct from *Cladophora* at generic rank, should *C. kosterae* and *C. okamurae* continue to be considered as members of *Cladophora*, or should they be recognized as species of *Basicladia*? These issues can now be resolved.

Molecular evidence shows *Cladophora* to be extremely diverse, forming an ancient assemblage from which several green algal lineages are derived. Even within a limited clade (e.g., the *Cladophora albida* (Nees) Kütz.–*C. sericea* (Hudson) Kütz. series), there were six distinct ITS sequence types (Bakker et al., 1995). More recent molecular studies involving a diverse assemblage of Cladophorales and Siphonocladales showed that various siphonoclad lineages were associated with different clusters of *Cladophora* species (Leliaert et al., 2003, 2007). Thus, if numerous traditional genera of siphonoclads belonging to multiple families continue to be recognized, *Cladophora* can no longer be considered a natural genus.

A similar conclusion regarding the monophyly of *Cladophora* was inherent in the results of Yoshii et al. (2004) and Yoshii (2006), in which a wide range of species of Cladophorales was examined for pigment composition and 18S ribosomal DNA (rDNA) sequences. *Cladophora* species were sister to species in other genera of Cladophorales and Siphonocladales, e.g., *Chaetomorpha* Kütz., *Cladophoropsis* Børgesen, *Valonia* C. Agardh, and *Pithophora* Wittr. Hence, the cladophoroid morphology is plesiomorphic or possibly homoplasious within the assemblage, and *Cladophora* needs to be broken down into monophyletic units that can be recognized at generic level. Some of these units may already have been characterized in the various sections of *Cladophora* (van den Hoek, 1963).

One such segregate from *Cladophora* characterized by Yoshii et al. (2004) is *Basicladia*. While virtually all authors continue to recognize *Basicladia* (e.g., Ernst & Norris, 1978; Colt et al., 1995; John, 2003; Garbary et al., 2007), AlgaeBase follows van den Hoek (1963) and states that *Basicladia* is a synonym of *Cladophora* (Guiry & Guiry, 2007).

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While the erect system of *Basicladia* with its branched, uniseriate filaments is similar to *Cladophora*, the poorly branched to unbranched, erect axes of *Basicladia* with very long initial cells in erect axes are characteristic. *Basicladia* species form a distinct basal layer of flattened, tightly packed cells, unlike the rhizoidal attachment of other *Cladophora* species. The association with turtles is diagnostic, even if not all species occur on turtles, and some species have been found on other substrata (Proctor, 1958; Normandin & Taft, 1959; van den Hoek, 1963). It is this heterotrichous basal layer that provides the basis for the association with turtles in that new erect filaments can be produced from a longer-lived basal system.

When van den Hoek (1963) reduced *Basicladia* to a section of *Cladophora* in his monograph of European *Cladophora*, none of the five species previously assigned to *Basicladia* were formally transferred. Furthermore, only two species were included in the section—the new species *C. kosterae* and *C. okamurae* (the latter transferred from *Chaetomorpha*; see Ueda, 1932). Neither species was found on turtles. Belusz and Reed (1969) later reported *C. kosterae* from North America as epizoic algae on turtles. The association of *C. kosterae* with *Basicladia* was later confirmed when Yoshii et al. (2004) used sequence data from type material of *C. kosterae* to show a sister group relationship between *C. kosterae* and two isolates of unidentified *Basicladia* from the United States in the UTEX culture collection (<http://www.utex.org/>).

Since *Basicladia* is a viable genus independent of *Cladophora*, and *C. kosterae* is part of the *Basicladia* clade, *C. kosterae* is hereby transferred to *Basicladia*. The morphology of *C. okamurae* is also definitive for *Basicladia* and that species is also transferred.

1. **Basicladia kosterae** (C. Hoek) Garbary, comb. nov. Basionym: *Cladophora kosterae* C. Hoek, Revision of the European Species of *Cladophora* 1963: 37. TYPE: France. Paris: Jardin des Plantes, alpine garden, on stones in artificial freshwater stream, 25 Apr. 1961, *C. van den Hoek n.61/9* (holotype, L not seen).

2. **Basicladia okamurae** (S. Ueda) Garbary, comb. nov. Basionym: *Chaetomorpha okamurae* S. Ueda, J. Imp. Fish. Inst., Tokyo 27: 23. 1932. *Cladophora okamurae* (S. Ueda) C. Hoek, Revision of the European Species of *Cladophora* 1963: 39. TYPE: Japan. Tokyo: Shirahama (Bôshû), s.d., *S. Ueda s.n.* (holotype, Tokyo University of Marine Science and Technology not seen).

The genus *Basicladia* now comprises seven species: *B. crassa*, *B. chelonum*, *B. kosterae*, *B. okamurae*, *B. ramulosa*, *B. sinensis*, and *B. vivipara*. Guiry and Guiry (2007) list *B. sinensis* and *B. vivipara* as having provisional status. Neither of these species has been redescribed since their first descriptions. *Basicladia sinensis* is particularly ambiguous, as it was described from a turtle many months after it had been brought to California from China (Gardner, 1937). *Basicladia sinensis* is also morphologically similar to *B. okamurae*. If these are conspecific, the latter has priority. *Basicladia vivipara* is known only from the freshwater snail *Viviparus malleatus* (Reeve). This apparent host specificity is analogous to that of the green alga *Sporocladopsis jackii* Garbary, C. J. Bird & K. Y. Kim (Garbary et al., 2005), which is known only from the marine snail *Ilyanassa obsoleta* (Say). Regardless, further studies are required on the status and relationships of *B. sinensis*, *B. okamurae*, and *B. vivipara*.

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Lectotypifications and a Validation in *Baccharis* (Asteraceae, Astereae) Names from Brazil

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ABSTRACT. The study of collections from the RB herbarium in Rio de Janeiro, Brazil, allows the lectotypification of three names in the Asteraceae: *Baccharis* ×*hoehneana* Teodoro, *B.* ×*paulopolitana* Teodoro & W. Hoehne, and *B.* ×*wilsoniana* Teodoro. Additionally, the name *B. lymanii* G. M. Barroso ex G. Heiden is validated by the indication of a holotype.

Key words: Asteraceae, Astereae, Baccharidinae, *Baccharis*, Brazil, Compositae.

Baccharis L. (Asteraceae) is a Neotropical, mostly dioecious genus comprising ca. 360 species (Nesom & Robinson, 2007), of which about 150 are found in all Brazilian biomes, most of these concentrated in savannas (cerrados), high-altitude fields (campos de altitude), and southern grasslands (campos sulinos) that occur between the southeastern states of Minas Gerais, Rio de Janeiro, and São Paulo and the southern states of Paraná, Santa Catarina, and Rio Grande do Sul.

During taxonomic studies of the genus *Baccharis* in Brazil, lectotypification of three names published by Malagarriga (authored as Irmão Teodoro Luis*; Malagarriga, 1949, 1954) and the validation of one published by Barroso (1976) became necessary, mainly because holotypes were not clearly indicated at the time of publication. For the current designation of type, the best preserved and most representative specimens, according to the protologues, were chosen from the original material.

1. **Baccharis** ×**hoehneana** Teodoro, Contr. Inst. Geobiol. 3: 5. 1954. [*Baccharis sebastianopolitana* Baker × *Baccharis cognata* DC.]. TYPE: Brazil. São Paulo: São Paulo, via Anhanguera, Km 30, 11 Apr. 1949, *W. Hoehne 2286* (lectotype, designated here, RB).

Malagarriga (1954) described *Baccharis* ×*hoehneana* considering the taxon as a hybrid between *B. sebastianopolitana* (= *B. microdonta* DC.) and *B. cognata*. Two collections were listed in the protologue: *Hoehne 2286*, with staminate florets, and *Hoehne s.n.*, with pistillate florets. The unnumbered Hoehne collection was not located by the authors, and it is not possible to confirm what material with pistillate heads might have been used by Malagarriga to describe the taxon. Thus, the remaining and staminate collection *Hoehne 2286* is here designated as lectotype. Barroso (1976) considered *B.* ×*hoehneana* as a synonym of *B. microdonta*, but our scrutiny suggests that this name better affines within the morphological variability represented by *B. cognata*, one of the presumptive hybrid parent taxa for *B.* ×*hoehneana*.

2. **Baccharis lymanii** G. M. Barroso ex G. Heiden, sp. nov. TYPE: Brazil. Santa Catarina: 9 Nov. 1956, *L. B. Smith & R. M. Klein 7461* (holotype, RB).

* The authority presentation here follows the original publication rather than the author entry on the International Plant Names Index.

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Barroso (1976) proposed *Baccharis lymanii* and provided a Latin description, but erroneously listed two specimens from separate gatherings as holotypes: *Smith & Klein 7461*, with pistillate florets, and *Smith 7418*, with staminate florets. Following the *International Code of Botanical Nomenclature* (McNeill et al., 2006) and sensu Article 37, this does not constitute the valid publication of *B. lymanii* in 1976. This name is validated herein by the reference to Barroso's original description (Barroso, 1976: 165) and clear indication of a single specimen as the holotype. Both collections were analyzed, and *Smith 7461* is selected as holotype due to its better preservation and congruency with the original description.

3. Baccharis ×paulopolitana Teodoro & W. Hoehne, Bol. Inform. Inst. Geobiol. "La Salle" 2: 17. 1949. [*Baccharis myricifolia* DC. ×*Baccharis tenuifolia* DC.]. TYPE: Brazil. São Paulo: São Paulo, Campo Congonhas, 2 Apr. 1946, *W. Hoehne 2096* (lectotype, designated here, RB).

The protologue of *Baccharis ×paulopolitana* (Malagarriga, 1949) cited two specimens as types: *Hoehne 2096*, with staminate florets, and *Hoehne 2095*, with pistillate florets. Only one of these syntypes (*Hoehne 2096*) was found during our revisionary studies in RB herbarium and it agrees with the original description.

Malagarriga and Hoehne (Malagarriga, 1949) first considered this taxon as a hybrid between *Baccharis tenuifolia* (= *B. linearifolia* (Lam.) Pers.) and *B. myricifolia*. However, all herbarium material determined as *B. myricifolia* by Malagarriga in Brazilian herbaria is now identified as *B. dracunculifolia* DC. Malagarriga (1954) later published an emendment to his original description of *B. ×paulopolitana*. In this emendment, the author justified that the protologue had some incorrect details, and that they reconsidered the taxon as a result of hybridization between *B. dracunculifolia* f. *denticulata* Heering and *B. pseudotenuifolia* Teodoro (= *B. linearifolia*), rather than *B. myricifolia* and *B. tenuifolia*. Although still considering *B. ×paulopolitana* as a hybrid taxon, Malagarriga and Hoehne (Malagarriga, 1954) did list additional specimens in the 1954 emendment.

Barroso (1976) considered *Baccharis ×paulopolitana* (sphalm., as *B. paulistana*) a synonym of *B. leptocephala* DC. (= *B. linearifolia*). On the other hand, Oliveira et al. (2006) considered *B. ×paulopolitana* a distinct species.

In this paper we formalize the lectotypification of *Baccharis ×paulopolitana* choosing *Hoehne 2096*, the only specimen of the syntypes found during our herbaria revision, which agrees with the original description.

4. Baccharis ×wilsoniana Teodoro, Bol. Inform. Inst. Geobiol. "La Salle" 2: 11. 1949. [*Baccharis sebastianopolitana* Baker ×*Baccharis pluridentata* Heering]. TYPE: Brazil. São Paulo: São Paulo, Parque do Estado, 23 Mar. 1946, *W. Hoehne 1931* (lectotype, designated here, RB).

Two specimens were listed as syntypes in the protologue of the hybrid name *Baccharis ×wilsoniana* (*Hoehne 1931* and *1934*). The only specimen found at RB, *Hoehne 1931*, agrees with the original description and is here designated as lectotype. Malagarriga (1949) considered the taxon a hybrid between *B. sebastianopolitana* (= *B. microdonta*) and *B. pluridentata* (= *B. pentodonta* Malme). Barroso (1976) listed the two Hoehne collections among the material examined as *B. microdonta* and considered *B. ×wilsoniana* a synonym of *B. microdonta*.

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Brickellia jimenezii (Asteraceae, Eupatorieae), a New Species from Guerrero, Mexico

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Abstract. The new species *Brickellia jimenezii* Hinojosa & Cruz Durán (Asteraceae, Eupatorieae) is described from Guerrero, Mexico. It belongs to the *Barroetea* A. Gray complex within *Brickellia* Elliot, and is similar to *B. subuligera* (Schauer) B. L. Turner. The new species presents heads with more florets ([45 to]74 to 106 vs. 30 to 50 in *B. subuligera*), larger style branches and anthers (to 3.7 mm and 2.1 mm, respectively, vs. to 2 mm and to 1.3 mm, respectively, in *B. subuligera*), as well as cypselae with four well-defined ribs on each face (vs. none or two on the exterior face and none or one on the interior face in *B. subuligera*). A key to this species complex and an illustration of the new species are provided.

Resumen. Se describe la especie nueva *Brickellia jimenezii* Hinojosa & Cruz Durán (Asteraceae, Eupatorieae) proveniente del estado de Guerrero, México. Esta especie pertenece al complejo *Barroetea* A. Gray de *Brickellia* Elliot, y está más emparentada con *B. subuligera* (Schauer) B. L. Turner. La especie nueva presenta cabezuelas con más flores ([45 a]74 a 106 vs. 30 a 50 en *B. subuligera*), ramas del estilo y anteras más grandes (hasta 3.7 mm y 2.1 mm, respectivamente, vs. hasta 2 mm y 1.3 mm, respectivamente, en *B. subuligera*), así como cipselas con cuatro costillas bien definidas en cada lado (vs. ninguna o dos en el lado exterior y ninguna o una en el interior en *B. subuligera*). Se proporcionan una clave para este complejo de especies y una ilustración de la especie nueva.

Key words: Asteraceae, Balsas Basin, *Barroetea*, *Brickellia*, Eupatorieae, Guerrero, IUCN Red List, Mexico.

The large genus *Brickellia* Elliot contains about 90 species, most restricted to the western United States, Mexico, and Central America; 78 of these are native to Mexico (King & Robinson, 1987; Turner, 1997). The genus is characterized by its graduate involucres, tubular corollas with small lobes, styles with enlarged basal nodes, cypselae with eight to 10 ribs, pappus bristles with flattened outer surfaces, and a base chromosome number of $x = 9$ (King & Robinson, 1987; Turner, 1997).

Within *Brickellia*, a group of five Mexican species (*B. laxiflora* (Brandegee) B. L. Turner, *B. pavonii* (A. Gray) B. L. Turner, *B. problematica* B. L. Turner, *B. sonorana* B. L. Turner, and *B. subuligera* (Schauer) B. L. Turner) are referred to as the *Barroetea* complex. This complex is characterized and differs from typical *Brickellia* by its herbaceous habit with tap roots, serrate leaves with apices and marginal teeth having cuspidate tips (but callose in *B. problematica*), and tangentially compressed cypselae with four to six ribs. Formerly, this group of species (except *B. sonorana*) had been recognized as the genus *Barroetea* A. Gray; however, Turner (1991a) transferred the species to *Brickellia*, and later on, he described *Brickellia sonorana* as a new member of the *Barroetea* complex (Turner, 1991b).

During taxonomic treatment of the Asteraceae for the municipality of Copalillo, located at the Balsas Basin in Guerrero, Mexico, several distinctive collections of the *Barroetea* complex of *Brickellia* were found. These differ from all the known species of the complex in having larger heads with up to 106 flowers and cypselae with four ribs on each face, and thus it is postulated to be a new species.

Brickellia jimenezii Hinojosa & Cruz Durán, sp. nov. TYPE: Mexico. Guerrero: Mpio. Copalillo, 3.12 km al E de Papalutla, 18°1′4.8″N, 98°52′52″O, 3 nov. 2007 (fl., fr.), *Oscar Hinojosa Espinosa 308* (holotype, FCME; isotypes, MEXU, MO). Figure 1.

Haec species *Brickelliae subuligerae* (Schauer) B. L. Turner similis, sed ab ea floribus in quoque capitulo numerosioribus, styli ramis sicut antheris longioriibus et cypselae pagina externa internaque 4-costata differt.

Annual *herbs* with tap roots, erect, 0.18–0.8 m high; *stems* terete, branched above, puberulent, brown to reddish purple. *Leaves* opposite and decussate (the upper branches with alternate, linear-lanceolate bracts), simple, at least the lower petiolate; blades

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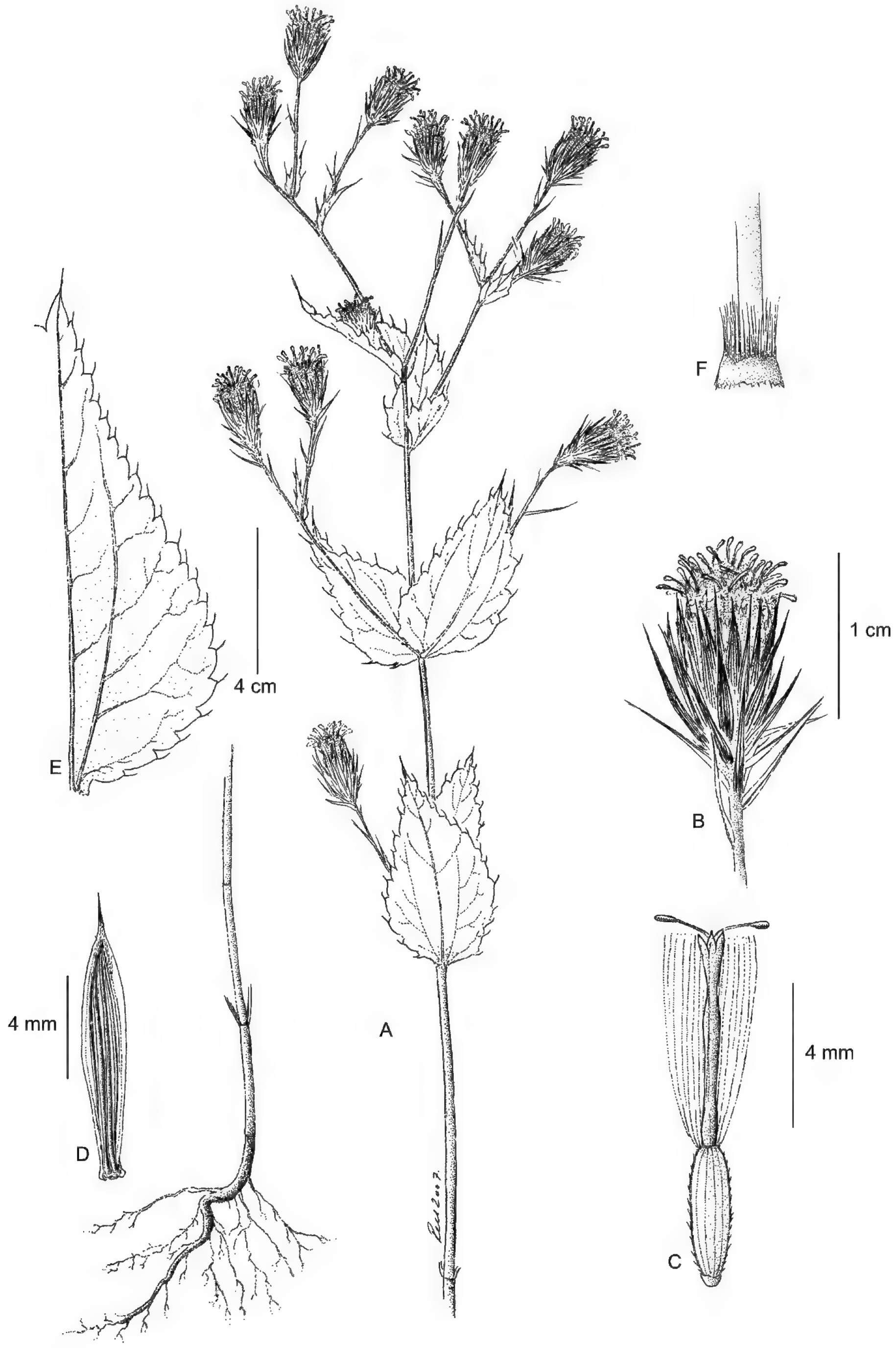

Figure 1. *Brickellia jimenezii* Hinojosa & Cruz Durán. —A. Flowering plant. —B. Head. —C. Floret. —D. Phyllary. —E. Leaf. —F. Stylar base. Drawn from the holotype *Hinojosa 308* (FCME).

1.2–4.5 × 0.9–2.5 cm, ovate, apices acute-cuspidate, margins serrate, the teeth with cuspidate tips, bases cuneate, puberulent to hirsute, abaxial surface resinous-dotted, trinervate; petioles 0–15 mm, sparsely to densely puberulent to pubescent. *Heads* discoid, homogamous, clustered in paniculate inflorescences; the ultimate peduncles terete to slightly sulcate, pubescent, 0.3–20 mm; *involucre* cylindric to cam-

panulate, 11–13 mm, the phyllaries linear-lanceolate to lanceolate, acuminate to cuspidate, with hyaline margins, adaxially with white-cream transverse ribs, resinous-dotted, pubescent, graduate in 4 to 6(to 7) series, the inner series wider than the exterior; *receptacle* plane, naked, glabrous, 2–3.5 mm wide. *Florets* (45 to)74 to 106 per head, hermaphrodite and fertile, 4–7 mm, cream to greenish cream; corolla tubular, the tube cylindric, often slightly constricted near the base, throat narrowly funnelform, with 5 ovate lobes, 0.4–0.5 mm, shortly papillose on abaxial and adaxial surfaces; *anthers* 5, 0.9–1.5(–2.1) mm, including the oblong, hyaline, apical appendages; *style branches* clavate, (3–)3.4–3.7 mm, with obtuse apices, base of the styles with pubescent nodes. *Cypselae* oblanceolate-oblong, 3.5–4.5 mm, tangentially compressed, with 10 hirsutulous ribs, 4 on each face and 1 on each side, basally with a cream carpopodium, 0.25–0.3 mm; *pappus* of 18 to 20 white capillary bristles, 5–7 mm, with flattened outer faces, their margins antrorsely barbed.

Distribution, ecology, and phenology. *Brickellia jimenezii* occurs in roadside ravines of tropical deciduous forest with *Aegopogon* Humb. & Bonpl. ex Willd. (Poaceae), *Acacia* Mill. (Fabaceae), *Boerhavia diffusa* L. (Nyctaginaceae), *Desmodium* Desv., *Lysiloma divaricatum* (Jacq.) J. F. Macbr., *Otopappus epaleaceus* Hemsl., *Pseudosmodingium perniciosum* (Kunth) Engl. (Anacardiaceae), and *Tecoma stans* (L.) Juss. ex Kunth (Bignoniaceae). The type locality is characterized by a warm and dry climate and tawny, rocky limestone soil at an altitude of ca. 910 m. At the time of the type collection in November, the population was apparently scarce, with the individuals seen presenting flowers and fruits, but most of their leaves were dry, especially the lower ones. By December, the plants were completely dry, presenting only fruits. Two additional herbarium specimens reveal that *B. jimenezii* presents fresher vegetative structures in September and October.

IUCN Red List category. *Brickellia jimenezii* is tentatively considered Vulnerable (VU D1+2) according to IUCN Red List criteria (IUCN, 2001), due to its population size estimated at less than 500 mature individuals and its known distribution from only three localities with a distributional area of less than 100 km^2.

Etymology. The species epithet honors Jaime Jiménez Ramírez, a taxonomist who invited the first author to participate as a scholar in the project "Estudio florístico de la porción guerrerense de la Cuenca del río Balsas," working with the family Asteraceae.

Relationships. *Brickellia jimenezii* belongs to the *Barroetea* complex within *Brickellia* because it has the characteristics of the species of this complex: herbaceous habit with tap roots, serrate leaves with apices and marginal teeth having cuspidate tips, and tangentially compressed cypselae. However, the new species differs from the other species of the *Barroetea* complex in having cypselae with four ribs on each face (vs. four to six ribs), heads with more florets ([45 to]74 to 106), and larger style branches ([3–]3.4–3.7 mm) and anthers (0.9–1.5[–2.1] mm).

Brickellia jimenezii is sympatric with only two species of the *Barroetea* complex: *B. pavonii* and *B. subuligera* (Turner, 1991b). According to the taxonomic treatments of McVaugh (1984) and Turner (1991b, 1997), and our personal observations, the new species is superficially similar to *B. subuligera*, a species with petiolate leaves, but with only 30 to 50 florets per head, style branches 1.5–2 mm long, anthers 1.3 mm or shorter (including apical appendages), and cypselae with zero to two ribs on the exterior face and zero to one rib on the interior face. *Brickellia jimenezii* is similar in size to *B. pavonii*, but the latter differs from the former by its sessile leaves, heads with only 25 to 30 florets, and cypselae with three or two ribs on the exterior face and one on the interior face.

KEY TO SPECIES OF THE *BARROETEA* COMPLEX OF *BRICKELLIA**

1a. Stems and leaves with glandular trichomes; leaf apices and marginal denticulations callose . . . . . *B. problematica*
1b. Stems and leaves without glandular trichomes; leaf apices and marginal denticulations cuspidate.
  2a. Heads with (45 to)74 to 106 florets; cypselae with 4 well-defined ribs on each face . . . . . *B. jimenezii*
  2b. Heads with 15 to 50 florets; cypselae with 0 to 2(3) ribs on the exterior face and 0 or 1 on the interior one.
    3a. Leaves all sessile or with petioles up to 3 mm long . . . . . *B. pavonii*
    3b. Leaves evidently petiolate, at least the basal ones.
      4a. Peduncles mostly 2–6(–7) cm long; Sonora and Sinaloa . . . . . *B. sonorana*
      4b. Peduncles 0–2 cm long; widespread in Mexico, but not in Sonora or Sinaloa.
        5a. Ultimate peduncles 1–5 mm long; florets 15 to 27 per head; central Veracruz, southern Puebla, and northern Oaxaca . . . . . *B. laxiflora*
        5b. Ultimate peduncles 5–10 mm long; florets 30 to 50 per head; Chihuahua and Coahuila to central Guerrero, but not in Puebla . . . . . *B. subuligera*

* Modified from Turner (1991b).

Paratypes. MEXICO. **Guerrero:** Mpio. Copalillo, 3.12 km al E de Papalutla, 1 dic. 2007 (fr.), *Hinojosa 322, 323, 324* (FCME); 2.5 km al NO de Papalutla, rumbo a Atenango del Río, 14 oct. 1992 (fl., fr.), *Ortiz 154* (FCME); 3 km al SO de Zicapa, 4 oct. 1981 (fl., fr.), *Lozada 52-ML* (FCME, MEXU).

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Rosa woodsii subsp. *puberulenta* and variety *ertterae* (Rosaceae), New in Western North America

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Abstract. An additional subspecies and two new varieties of *Rosa woodsii* Lindl. (Rosaceae) are recognized in western North America. *Rosa woodsii* subsp. *puberulenta* (Rydb.) W. H. Lewis & Ertter, characterized by an open habit and moderately curved prickles, is the predominant bottomland subspecies occurring in the Colorado Plateau of Colorado, Utah, Arizona, Nevada, New Mexico, and Wyoming. Atypical unarmed populations of *R. woodsii* subsp. *arizonica* (Rydb.) W. H. Lewis & Ertter endemic to Oak Creek Canyon in the Mogollon Rim region of Coconino County, Arizona, are described as *R. woodsii* var. *ertterae* W. H. Lewis. The new combination *R. woodsii* var. *arizonica* (Rydb.) W. H. Lewis is provided for the remainder of *R. woodsii* subsp. *arizonica*. A key to the six subspecies of *R. woodsii* is provided.

Key words: Arizona, Colorado Plateau, IUCN Red List, Oak Creek Canyon, *Rosa*, Rosaceae.

Rosa woodsii Lindl. is unquestionably the most widespread and variable species of *Rosa* L. in North America. The species ranges from southeastern Alaska to north-central Mexico and extends throughout western and central Canada and the United States east of the Sierra-Cascade Axis. In a previous paper (Lewis & Ertter, 2007), we recognized five ecogeographically defined subspecies within the boundaries of *Flora of North America North of Mexico*: *R. woodsii* subsp. *arizonica* (Rydb.) W. H. Lewis & Ertter, subspecies *gratissima* (Greene) W. H. Lewis & Ertter, subspecies *manca* (Greene) W. H. Lewis & Ertter, subspecies *ultramontana* (S. Watson) Roy L. Taylor & MacBryde, and the autonymic subspecies *woodsii*. Within subspecies *gratissima*, one variety was recognized, *R. woodsii* var. *glabrata* (Parish) D. Cole, localized in the San Bernandino Mountains of California. The status of *R. woodsii* var. *maderensis* Henrickson, endemic to northern Mexico, has not yet been evaluated but is provisionally included within subspecies *woodsii*. Ongoing investigation leads us to recognize a sixth subspecies centered on the Colorado Plateau for which the combination *R. woodsii* var. *puberulenta* (Rydb.) W. H. Lewis & Ertter is here provided for use in a pending volume of *Flora of North America North of Mexico*. This conclusion is primarily based on a re-evaluation of herbarium specimens housed at and on loan to the Missouri Botanical Garden, field studies and new collections made in 2008 and 2009, and statistical analysis of sepal glandularity (Table 1) along the lines of comparable studies in other groups of *Rosa* undertaken by the senior author (e.g., Lewis, 1959a, b). Several collections cited as other subspecies in our previous paper (Lewis & Ertter, 2007), including the types of *R. bakeri* Rydb., *R. chrysocarpa* Rydb., and *R. neomexicana* Cockerell, are here assigned to subspecies *puberulenta*. In that same paper (Lewis & Ertter, 2007), we also included *R. adenosepala* Wooton & Standl. as a synonym of *R. woodsii* subsp. *arizonica*, but it is correctly a synonym of subspecies *woodsii*.

1. Rosa woodsii Lindl., Ros. Monogr. 21. 1820. TYPE: U.S.A. (Nebraska–Iowa to Montana, not Missouri): near Missouri River, seeds grown by J. Sabine, Royal Hort. Society; "cultiv. HHS 1825" on herb. collection of plant designated "type" five years following publication of species (neotype, designated by Lewis & Ertter, 2007: 346, CGE).

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Table 1. Comparison of subspecies of *Rosa woodsii*.

No.	*R. woodsii* subspecies	Collections examined*	Stipitate-glandular (%)†	Eglandular (%)‡	Average elevation (ft.)	Range elevation (ft.)
1	*woodsii* South 49°N	176	20	80	4593	470–11,500
2	*woodsii* North 49°N	69	45	55	1738	545–7500
3	*manca*	44	68	32	8703	7000–11,000
4	*arizonica*	88	58	42	7010	5080–10,660
5	*ultramontana*	177	6	94	4136	1200–8000
6	*puberulenta*	37	5	95	6124	4500–7874
7	*gratissima*	29	0	100	6545	3000–10,000

* Collections of subspecies examined from U.S. states and Canadian provinces/territories: (1) AZ, CO, IA, KS, MO, MT, ND, NE, NM, OK, SD, TX, WY; (2) AB, BC [E Rocky Mtns.], MB, NT, SK; (3) AZ, CO, NM, UT, WY; (4) AZ, NM, NV, UT; (5) BC [W Rocky Mtns.], CA, CO, ID, MT, NV, OR, UT, WA; (6) AZ, CO, NV, UT, WY; (7) CA, NV.

† Percentage of collections with sepals abaxially stipitate-glandular.

‡ Percentage of collections with sepals strictly abaxially eglandular or few marginal stipitate glands.

KEY TO THE SUBSPECIES OF *ROSA WOODSII* NORTH OF MEXICO

1a. Prickles most commonly curved, infrastipular, rarely absent; sepals often stipitate-glandular (except subspecies *puberulenta*); centered in Colorado Plateau Subprovince.
  2a. Shrubs mostly < 1 m, forming ± open stands, tending to be densely branched; terminal leaflets obovate, less often elliptic, cuneate based, single or multi-serrate; high montane forests to scrub-oak woodlands . . . . . subsp. *manca*
  2b. Shrubs mostly 1–3 m or more, often forming dense thickets, openly branched; terminal leaflets ovate to elliptic, cuneate or round based, single serrate; riparian sites in bottomlands extending into mountainous regions along waterways.
    3a. Sepals generally eglandular; prickles slightly to fully curved, often slender; terminal leaflets commonly longer than 1 cm; epicenter of Colorado Plateau Subprovince . . . . . subsp. *puberulenta*
    3b. Sepals most commonly stipitate-glandular; prickles usually strongly curved, short and stout to long and hooked or occasionally introrse; terminal leaflets commonly shorter than 1 cm; Apachian and southern edge of Colorado Plateau Subprovinces . . . . . subsp. *arizonica*

1b. Prickles commonly straight (straight or curved in subspecies *gratissima*), absent to infrastipular to dense; sepals rarely stipitate-glandular (except 45% subspecies *woodsii* N of 49° parallel in Canada); mostly west of Wasatch Range or east of the Continental Divide.
  4a. Shrubs mostly 1(–2) m, tending to be densely branched; terminal leaflets mostly obovate; centered in the prairies and plains east of the Continental Divide, occasionally extending west through passes . . . subsp. *woodsii*
  4b. Shrubs mostly 1–3 m or more, open to densely branched; terminal leaflets ovate to elliptic to obovate; mostly within or west of Wasatch Range and northern Rocky Mountains.
    5a. Prickles commonly slender, sparse to absent in upper stems, mostly absent on flowering branches; stems openly branching; flowers mostly 3 to 10 or more per inflorescence; centered in northern Great Basin and Columbia Plateau . . . . . subsp. *ultramontana*
    5b. Prickles commonly stout, abundant, present on flowering branches; stems densely branching; flowers mostly 1 to few per inflorescence; centered in Mojave Desert . . . . . subsp. *gratissima*

The new subspecies adds to the five subspecies previously recognized for *Rosa woodsii* (Lewis & Ertter, 2007) as part of the forthcoming treatment for the *Flora of North America*.

1a. Rosa woodsii Lindl. subsp. **puberulenta** (Rydb.) W. H. Lewis & Ertter, comb. et stat. nov. Basionym: *Rosa puberulenta* Rydb., Fl. Rocky Mts. 443, 1062. 1917. TYPE: U.S.A. Utah: San Juan Co., Montezuma Canyon, E of Monticello, 2000 m [elevation from original protologue], 13 Aug. 1911, *P. A. Rydberg & A. O. Garrett 9705* (holotype, NY 415876; isotype, US 765307).

Rosa bakeri Rydb., Fl. Colorado 191. 1906, nom. illeg., non *R. bakeri* A. Dégl., J. Bot. 2: 267. 1894, syn. nov. TYPE: U.S.A. Colorado: La Plata Co., Dix Post Office, 1898, *C. F. Baker, F. S. Earle & S. M. Tracy 474* (lectotype, designated by Lewis & Ertter, 2007: 350, MO 123806; isotypes, BM, E, K, MO 1951244, NY).

Rosa chrysocarpa Rydb., Bull. Torrey Bot. Club 44: 74. 1917, syn. nov. TYPE: U.S.A. Utah: San Juan Co., Allen Cañon, SW of Abajo Mtn., 1800–2000 m, 30–31 July 1911, *P. A. Rydberg & A. O. Garrett 9302* (holotype, NY 415920; isotype, US 765208).

Rosa neomexicana Cockerell, Entomol. News 12: 38. 1901, syn. nov. *Rosa woodsii* var. *neomexicana* (Cockerell) W. C. Martin & C. R. Hutchins, Fl. New Mexico 929. 1980, nom. illeg. [basionym not provided]. TYPE: U.S.A. New Mexico: Otero Co., Sacramento Mtns., Cloudcroft, grown and collected at Mesilla, New Mexico, 4 May 1894, *T. D. A. Cockerell s.n.* (lectotype, designated by Lewis & Ertter, 2007: 350, US 404918; isotype, NY 425856).

Discussion. *Rosa woodsii* subsp. *puberulenta* is characterized by tall stems (1–2 m or more) with limited branching, presenting an open habit. Slender to

moderately thickened prickles, mostly limited to the infrastipular position, are commonly slightly curved, but occasionally fully curved, hooked, or introrsed. Terminal leaflets are mostly broadly elliptic and 2–4 cm long. Sepals are eglandular or with few marginal glands in 95% of examined specimens throughout its range (Table 1). As so characterized, subspecies *puberulenta* is the predominant *Rosa* occurring on bottomlands in the epicenter of the Colorado Plateau Subprovince (McLaughlin, 1989, 2007), comprising Utah east of the Wasatch Range, southwestern Colorado, northwestern New Mexico, and northeastern Arizona. Populations are mostly found in basins by creeks and rivers, river flats, and riparian woodlands, dominated by cottonwood and pine, at elevations of 4500–7900 ft., averaging 6124 ft. (Table 1).

Morphologically comparable specimens exist as far from the distributional epicenter as southeastern Washington and northeastern California, but whether these are best treated as outliers of subspecies *puberulenta* or as sporadic, localized variation within subspecies *ultramontana* remains to be determined. At present, we accept at least the populations cited below from eastern Nevada and southern Wyoming, along with those from the core range, as subspecies *puberulenta*. More problematic are areas deep within the core range of subspecies *ultramontana*, notably the high frequency of collections with curved prickles from the Owyhee Uplands of southwestern Idaho and adjacent Oregon. Populations from the Wasatch Range interface between the two subspecies are ambiguous, as are collections sympatric with subspecies *gratissima* in southern Nevada. Such ambiguity is compatible with our use of ecogeographically defined subspecies (Lewis & Ertter, 2007).

Because of its central location, *Rosa woodsii* subsp. *puberulenta* approaches or overlaps the distribution of all five other subspecies of *R. woodsii* in North America north of Mexico: subspecies *woodsii* to the east, subspecies *arizonica* to the south, subspecies *gratissima* to the southwest, and subspecies *ultramontana* to the northwest. The range of subspecies *manca* is largely sympatric, differing by higher elevation averaging 8703 ft. (Table 1) and habitat (scrub-oak woodlands to high montane forests). An updated key to the six currently recognized subspecies is provided above, emphasizing prickle curvature, sepal glandularity, and general habit. Sepal glandularity, as statistically analyzed in Table 1, is particularly important in distinguishing subspecies *puberulenta* (sepals eglandular or infrequently with few marginal glands in 95% of examined specimens) from subspecies *arizonica* and subspecies *manca*, with the former having 58% and the latter having 68% of collections with stipitate-glandular sepals (Table 1). As noted, the interface and distinction are particularly problematic between subspecies *puberulenta* and subspecies *ultramontana*, a subspecies centered in the Great Basin Subprovince (McLaughlin, 1989, 2007) extending north into central British Columbia (Lewis & Ertter, 2007). Both subspecies have a similar open branching habit and eglandular sepals (95% and 94%, respectively; Table 1). However, the prickles of subspecies *ultramontana* are generally straighter, more slender, and often sparser, and flowers can be more numerous (up to 25 flowers per inflorescence vs. one to four in subspecies *puberulenta*). The correlation of morphological and ecogeographic differences is consistent with our use of subspecies in *Rosa* (Lewis & Ertter, 2007).

Selected exsiccatae. U.S.A. **Arizona:** Apache Co., Canyon de Chelly, Tunnel Canyon, *S. L. O'Kane Jr. & G. Rink 6133* (ISTC, SJNM); Greer Hwy., 12 July 1976, *R. Galeano s.n.* (ASC); Navajo Nation, Carrizo Mtns., Teec Nos Pos Canyon, *T. Reeves 10483* (SJNM); Chuska & Tunitcha Mtns., Rte. 13, ca. 4.7 mi. NE of Lukachukai, *T. Reeves 8419* (NAVA, SJNM); Navajo Co., Navajo Nation, Oak Springs near head of Piute Canyon, *S. L. O'Kane Jr. et al. 6190* (ISTC, SJNM). **Colorado:** Archuleta Co., Lower San Juan Mtns., N face of Needles Mtn., *M. Heil 93* (SJNM); Pagosa Springs, *C. F. Baker 399* (E, G, MO); Dolores Co., rd. 12, ca. 1 mi. S of Road J stock pond, *K. Heil & L. Lundquist 23917* (MO, SJNM); 5 mi. E of Dove Creek, 4 July 1975, *M. Heil s.n.* (SJNM); Dove Creek, rd. to Dolores overlook, *K. Heil 958* (SJNM); Gunnison Co., Gunnison, *C. F. Baker 532* (E, MO); Mesa Co., 2.4 mi. SE of Gateway, along SW bank of Dolores River, *C. B. Davis 279* (MO); Montezuma Co., 4–5 mi. E of hwy. 145 on Hwy. 184 from Dolores to Mancos, *B. Ertter & L. Woodruff 18478* (MO, UC); Dolores City Park on E side of town, N side of Dolores River, *B. Ertter & L. Woodruff 18477a & b* (MO, UC); Mancos Canyon, 2 mi. up canyon toward San Juan Natl. Forest on rd. 42, *W. H. Lewis & M. Elvin-Lewis 15998* (MO); Montrose Co., 2 mi. W of bridge at Atkinson Creek near Uravan, Y11 rd. along San Miguel River betw. Uravan & Bedrock, *B. Ertter et al. 18471* (MO, UC); Coventry, *E. P. Walker 543* (MO, RM), betw. Montrose & Naturita, 2.3 mi. W of Ute along Rte. 90, *B. Ertter et al. 18468* (MO, UC); 5 mi. S of Montrose, Hwy. 55, *B. Maguire & G. Piranian 12834a* (MO, NY); Naturita, *E. B. Payson & L. B. Payson 3878* (MO); Dolores River at Bedrock, *Payson & Payson 3918* (MO); Sheep Creek Cañon, *Payson & Payson 3889* (MO), *3890* (MO); Paradox, *E. P. Walker 121* (MO, RM); Routt Co., 13.3 mi. S of Hayden, Hayden Gulch rd. 53, 1.8 mi. N of jct. with rd. 29, Williams Fork Mtns., *B. Ertter & L. Woodruff 19190* (MO, UC); San Miguel Co., ca. 2 mi. SW of Egnar near crossing of Chico Creek, *K. Heil et al. 19071* (SJNM). **Nevada:** Lincoln Co., base of Bald Mtn., E of Nellis Air Force range, s.d., *P. L. Comanor s.n.* (RENO); Caliente, *L. N. Goodding 941* (NAVA); 11 mi. SSW of Caliente, Kershaw Canyon, *I. LaRivers & N. F. Hancock 673* (RENO); Kershaw–Ryan State Park, *J. H. Robertson 51–74* (RENO); White Pine Co., Baker Creek, Governor's camp, Mt. Jeff Davis, *B. Maguire & A. G. Richards 2656* (UC); fork of Berry Creek, 2.5–4 mi. above Berry Creek Ranger Station, *P. Train 1046* (RENO), along Lehman Creek at Trailer Camp, *J. H. Robertson 56–74* (RENO); 1 mi. S of Lehman Cave's Ranger Station, *B. O. Moore & G. E. Franklin Jr. 565* (RENO); 16 mi. N of McGill, Indian Creek, Schell Creek Range, *P. Train 987*

(RENO); W of Ely, by Hwy. 50, *R. Everett s.n.* (RENO); 15 mi. E of Ely, *B. O. Moore & G. E. Franklin Jr. 696* (RENO); 18 mi. E of Ely off Hwy. 486, just N of Cave Lake State Park along Steptoe Creek, *W. Hess et al. 7596* (MO, MOR). **New Mexico:** Rio Arriba Co., Chama, *C. F. Baker 398* (G, K, MO); San Juan Co., 2 mi. W of Aztec, river bottom, *M. Sullivan 898* (SJNM); Jewett Valley Tract (BLM), access at #147 CR 6700, *T. Reeves & L. Reeves 9418* (SJNM); Sandoval Co., Cuba, 1924, *s. coll.* (MO). **Utah:** Beaver Co., 10 mi. E of Beaver on Hwy. 135, Beaver Creek Canyon, Tushar Mtns., *A. J. Breitung 17860* (BM, DAO); ca. 13 mi. ENE of Milfred, Bailey's Spring, *s. coll. 13950* (BRY, MO); Carbon Co., along Price River, *L. H. Malbutt 40* (MO, UT); 10 mi. N of Wellington, Pine Canyon, *E. H. Graham 8315* (CM, MO); Daggett Co., S Green Lakes, *F. J. Hermann 4858* (MO); Duchesne Co., N of Moon Lake, *E. H. Graham 6535* (CM, MO); 4 mi. N of Mtn. Home, *B. F. Harrison & E. Larsen 7592* (BRY, MO); N side of Strawberry Creek, ca. 5 mi. below mouth of Red Creek, *E. H. Graham 9270* (CM, MO); Emery Co., 12 mi. W of Castle Dale, *H. C. Cutler 2379* (MO); Garfield Co., near head of W Fork of Douglas Creek, *E. H. Graham 9696* (CM, MO); 6 mi. W of Panguitch Lake, *G. J. Goodman & C. L. Hitchcock 1600* (MO); Kane Co., vic. of Pine Spring, W of Coral Pink Dunes, *S. L. Welsh 25005* (BRY, MO); San Juan Co., Dugout Ranch, Indian Creek, *S. L. Welsh 20845* (BRY, RENO); Hammond Canyon, Elk Mtns., *P. A. Rydberg & A. O. Garrett 9581* (NY, RENO); Montezuma Canyon, ca. 13 air mi. SSE of Monticello, 6 mi. from Hwy. 191 on Montezuma Creek rd., *B. Ertter & L. Woodruff 18481* (MO, UC); Natural Bridges Natl. Monument, canyon across Kachina Bridge, *L. Vermillion 23* (SJNM); Navajo Nation, rd. 408, ca. 2 mi. SE of Blanding, *K. Heil et al. 24062* (MO, SJNM); San Juan/Grant Co., Manti-La Sal Natl. Forest, Castle Creek basin, *C. Evrard 12295* (BR, MO); Uintah Co., Davis Hollow, Taylor Mtn., *E. H. Graham 7492* (CM, MO); side of Green River, Island Park, *E. H. Graham 9189* (CM, MO); Dry Fork/Brownie Canyon rd., 3.5 mi. NW of Dry Fork settlement, ca. 14 air mi. NW of Vernal, *B. Ertter & L. Woodruff 19176* (MO, UC); Washington Co., SE of Enterprise Reservoir, Grassy Creek, *L. Higgins 19725* (BRY, MO). **Wyoming:** Lincoln Co., Alpine, Wolf Creek near Snake River, *E. B. Payson & G. M. Armstrong 3608* (MO, RM); Sublette Co., Big Piney, *E. B. Payson & L. B. Payson 4356* (MO, RM); Sweetwater Co., 12 mi. below Green River, *H. C. Cutler 3401* (MO); Teton Co., Hoback River, Camp Davis, *L. E. Wehmeyer et al. 5142* (MICH, MO).

In accordance with our use of the varietal rank for significant but highly localized elements (Lewis & Ertter, 2007), unarmed to scarcely prickly collections from Oak Creek Canyon on the Mogollon Rim of Arizona are here described as a new variety of *Rosa woodsii*, included within subspecies *arizonica*. This also necessitates establishing variety *arizonica* as a new combination.

2. Rosa woodsii Lindl. subsp. **arizonica** (Rydb.) W. H. Lewis & Ertter. Basionym: *Rosa arizonica* Rydb., N. Amer. Fl. 22: 516. 1918. TYPE: U.S.A. Arizona: Coconino Co., vic. of Flagstaff, 2134 m, 15 June 1898, *D. T. Macdougal 110* (holotype, NY; isotypes, F, GH, NY, RM, UC, US).

2a. Rosa woodsii Lindl. var. **ertterae** W. H. Lewis, var. nov. TYPE: U.S.A. Arizona: Coconino Co., Oak Creek Canyon at beginning of West Fork Trail, partial shade of riparian forest, 12 Aug. 2004, *B. Ertter 18488 with L. Woodruff* (holotype, MO 6113144; isotypes, ARIZ, ASC, ASU, E, K, MO 6113143, NY, RSA, UC, US).

Haec varietas a *Rosa woodsii* subsp. *arizonica* (Rydb.) W. H. Lewis & Ertter var. *arizonica* (Rydb.) W. H. Lewis caulibus ramisque aculeis plerumque destitutis, habitu aperte ramificante atque sepalis glandulis stipitatis tantum vestitis differt.

Distribution, habitat, phenology, and IUCN Red List category. *Rosa woodsii* var. *ertterae* is endemic to the West Fork of Oak Creek Canyon, and perhaps nearby canyons (Barney Springs, Casner Cabin Draw, Fernow Draw) of Coconino Co., Arizona, between 34°58′55″N and 111°51′45″W along the Mogollon Rim. This variety flowers in late May and June, with hips maturing in August and September, growing on well-drained slopes and in riparian forests and creek beds at elevations of 5300 ft. at the Canyon mouth to 7000 ft. at the rim. The trailhead parking lot near the mouth of the canyon has been significantly altered over the past 100 years where garden relics and many non-native species have been introduced (Gilbert & Licher, 2005), and so sets the area apart from the pristine conditions found in the West Fork Canyon. This suggests a nearby source of potential contaminants, which could eventually prove damaging to the canyon flora, including *R. woodsii* var. *arizonica* found in disturbed areas near the canyon mouth (Coconino Co., 9 mi. N of Sedona, U.S. alt. rte. 89 to Oak Creek Canyon, 35°00′N, 111°40′W, 1 July 1992, *J. S. Miller et al. 7746* [MO]). Regarding an IUCN conservation assessment of variety *ertterae*, the category Near Threatened (NT) seems most applicable due to restricted occurrence in a heavily used area and the possibility of interbreeding with other *R. woodsii* that occur nearby (IUCN, 2001).

Etymology. The varietal epithet *ertterae* was chosen to recognize Barbara Jean Ertter (b. 1953), renowned botanist of the Rosaceae in western North America and fellow rhodologist, who observed the uniqueness of the Oak Creek Canyon rose and who, together with Lindsay Woodruff, collected the type material.

Discussion. *Rosa woodsii* var. *ertterae* differs from populations of *R. woodsii* var. *arizonica* (Rydb.) W. H. Lewis by having stems and branches that lack prickles even on lower stems or have few, small, curved, and infrastipular prickles; an open branching habit; and only stipitate-glandular sepals.

Paratypes. U.S.A. **Arizona:** Coconino Co., Coconino Natl. Forest, Upper West Fork Canyon of Oak Creek, ca. 10 mi. N of Sedona, within N section of Red Rock/Secret Mtn. Wilderness, 35°1′32″N, 111°50′37″W, 6358 ft., riparian, within creek bed, 24 June 2000, *E. Gilbert 78* (ASC, ASU); Oak Creek Canyon, 16 June 1928, *C. F. Deaver 3186* (ASC); W Fork of Oak Creek, Barney Pasture, 6500 ft., 18 Sep. 1952, *C. F. Deaver 4129* (ASC); well-drained slope, ca. 5300 ft., 17 June 1967, *H. Reese s.n.* (ASC); Upper Oak Creek, 18 Aug. 1945, *C. F. Deaver 1211* (ASC); Oak Creek Canyon at beginning of W Fork trail, 12 Aug. 2004, 4700 ft., *T. Weaver s.n.* (ASC); Mogollon Mtns., Pinchot Ranger station, 6398–7480 ft., s.d., *R. E. Collom 246* (MICH, MO); W Fork of Oak Creek, 111°45′W, 35°3′N, ca. 5300 ft., 27 July 1997, *L. R. Landrum & S. S. Landrum 9094* (ASU); ponderosa zone along stream, 1 Aug. 1975, *L. Pinkava & E. Lehto L18784* (ASU); Oak Creek Canyon, 10 mi. up from Sedona, 24 May 1936, *McLellan & Stitt 890* (ASU).

2b. Rosa woodsii var. **arizonica** (Rydb.) W. H. Lewis, comb. nov. Basionym: *Rosa arizonica* Rydb., N. Amer. Fl. 22: 516. 1918. TYPE: U.S.A. Arizona: Coconino Co., vic. of Flagstaff, 2134 m, 15 June 1898, *D. T. Macdougal 110* (holotype, NY; isotypes, F, GH, NY, RM, UC, US).

Rosa granulifera Rydb., N. Amer. Fl. 22: 517. 1918. *Rosa arizonica* var. *granulifera* (Rydb.) Kearney & Peebles, J. Wash. Acad. Sci. 29: 481. 1939. TYPE: U.S.A. Arizona: Navajo Co., W of Holbrook, 10 July 1896, *M. Zuck s.n.* (holotype, NY 415841; isotypes, MO 123818, NY 415840, US 348991).

Discussion. The creation of variety *ertterae* necessitates a corresponding varietal name for the remainder of subspecies *arizonica*, even though such a large circumscription does not represent our concept of varieties in *Rosa* (Lewis & Ertter, 2007). Because the autonym corresponding to *R. woodsii* var. *ertterae* is variety *woodsii* (McNeill et al., 2006: Art. 26.3), explicit publication is needed for the creation of *R. woodsii* var. *arizonica*, as is done here. Although sometimes ascribed to Martin and Hutchins (1980–1981), their combination is invalid because the basionym was not cited. Priority of the varietal epithet *arizonica* dates from 1939, as the autonym *R. arizonica* Rydb. var. *arizonica* created by the publication of *R. arizonica* Rydb. var. *granulifera* (Rydb.) Kearney & Peebles. Following Recommendation 26A.1 of the *International Code of Botanical Nomenclature* (McNeill et al., 2006), we choose variety *arizonica* rather than variety *granulifera* for use within subspecies *arizonica*.

Data summarizing presence or absence of sepal glandularity and elevation of the six *Rosa woodsii* subspecies are provided in Table 1. Additionally, the subspecies *woodsii* is divided into North and South units representing populations found north and south of the 49° parallel from the Rocky Mountains to the east. This separation shows major differences in sepal glandularity between northern populations having 45% stipitate-glandular sepals compared to only 20% such glandularity in southern populations. In Saskatchewan (North), Harms (1974) reported that sepals are sometimes glandular as well as leaflets and their serrations. In addition, his measurements of petals, hypanthia, sepal bases, and leaflets are larger than those found in populations in the South, and leaflets are more numerous (five to nine) and crowded. He attributed, at least in part, these differences to hybridization, recognizing putative hybrids between *R. woodsii* × *R. arkansana* Porter (2*x* × 4*x*) and *R. woodsii* × *R. acicularis* Lindley (2*x* × 6*x*), the latter given some credence with the finding of a tetraploid (4*x*) in mixed populations of both species at Fort Saskatchewan, Alberta (Lewis, unpublished).

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A New Species of *Rhodiola* (Crassulaceae) from Western Sichuan, China

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ABSTRACT. *Rhodiola wenchuanensis* Tao Li & Hao Zhang (Crassulaceae) is described and illustrated from Wenchuan County, in western Sichuan Province, China. The new species is related to *R. discolor* (Franch.) S. H. Fu, but differs in having smaller plants with densely puberulent stems and pedicels and sessile leaves. It is characterized by its obviously dentate leaf margins; a petal to stamen length ratio less than or equal to 1; crimson sepals, petals, and ripe fruits; and a carpel that is not developed in the staminate flower. The new species is assigned to series *Bupleuroides* (Frodin) S. H. Fu within section *Rhodiola* L. on the basis of its dioecy and its flowers in terminal corymbs with four or five erect, shortly oblong carpels with the apex not revolute and the base broad.

Key words: China, Crassulaceae, IUCN Red List, *Rhodiola*, sect. *Rhodiola*, Sichuan.

Rhodiola L. (Crassulaceae) consists of 96 species that are distributed mainly in alpine regions throughout the central Himalayan Mountains to the Qinghai-Tibetan Plateau and to the European Alps. Species in the genus are herbaceous perennials of alpine meadows, forests, and mountain glacier habitats. There are 73 species, two subspecies, and seven varieties in China (Fu, 1984). *Rhodiola* plants are mainly distributed in southwestern and northwestern China, with most taxa (32 species and two varieties) located in Tibet, and with 22 species in Sichuan Province (Wu, 1985; Ji et al., 2007). During fieldwork in 2006 and 2007 as part of the floristic survey of *Rhodiola* on the Qinghai-Tibetan Plateau in western Sichuan Province, three populations of an unknown taxon were collected first on Balang Mountain in Wenchuan County and later on Jiajin Mountain in Baoxing County. After comparison with specimens of the closely related species *R. discolor* (Franch.) S. H. Fu in CDBI, CDCM, KUN, LSDC, PE, SM, SZ, and WCU, it was decided to describe this material as a new species.

Rhodiola wenchuanensis Tao Li & Hao Zhang, sp. nov. TYPE: China. Sichuan: Wenchuan Co., Mt. Balang, 3600–3700 m, 7 July 2006, *T. Li 060707* (holotype, WCU). Figure 1.

Haec species quoad rhizomata gracilia et habitum dioecium *Rhodiolae discolori* (Franch.) S. H. Fu affinis, sed ab ea statura breviore, caulibus et pedicillis dense puberulis, folis sessilibus margine dentatis, petalis staminibus brevioribus vel aequalibus, sepalis petalis et fructibus maturitate carmesinis atque floribus masculinis carpellis carentibus differt.

Perennial herb; rhizomes slender and horizontal, yellowish brown or dark brown, to 7 cm, 0.7–4 mm diam., apex covered with multiple layers of dark red-brown, trilateral, membranous scale leaves; roots very fine, to 5 cm, ca. 0.5 mm diam.; stems 2.5–9 cm tall, ca. 1 mm diam., single or rarely few per plant, erect, green-white, not branching, densely puberulent with unicellular simple trichomes. Leaves alternate, fleshy, ovate-elliptic or ovate, (2–)5–9(–15) × (1.5–)3–5(–6) mm, sessile, glabrous, apex acute or slightly obtuse, sometimes slightly involute, base cordate or rounded, margins obviously bidentate or tridentate in the upper 2/3 on each side, not revolute, adaxial surface dark green, glabrous, abaxial surface jade green, glabrous, the midrib not convex abaxially. Inflorescence a terminal corymb, rarely single, 2- to 16-flowered, dioecious with unisexual flowers, 0.4–1.8 × 0.6–3 cm, with leaflike bracts. Staminate flowers with longer pedicels, 2–9 mm, densely puberulent; sepals 5, crimson, triangular, ca. 0.5 mm; petals 5, crimson, narrowly oblong to oblong, 1.1–1.5 × 0.6–1 mm; stamens 10, filaments red, anthers yellow, rounded, those opposite the petals to 1.5 mm and inserted in the base of petals, when opposite the sepals to 1.8 mm, carpels undeveloped. Pistillate flowers with shorter pedicels, 1–4 mm, densely puberulent; sepals and petals each 5, crimson; sepals triangular, ca. 0.8 mm; petals oblong, ca. 1.2 × 0.3 mm; stamens absent; squamules in the base of carpels 4 or 5, square, ca. 0.5 × 0.5 mm, rounded or emarginate; carpels 4 or 5, oblong, erect, ca. 2.2 × 1 mm, carpels basally connate, each with a short style to 0.6 mm. Follicles erect, ca. 2.5 mm, 0.8–1 mm diam., connective ca. 1.5 mm in base, beak outward-curved, ca. 0.5 mm, crimson at maturity; seeds 7 to 10.

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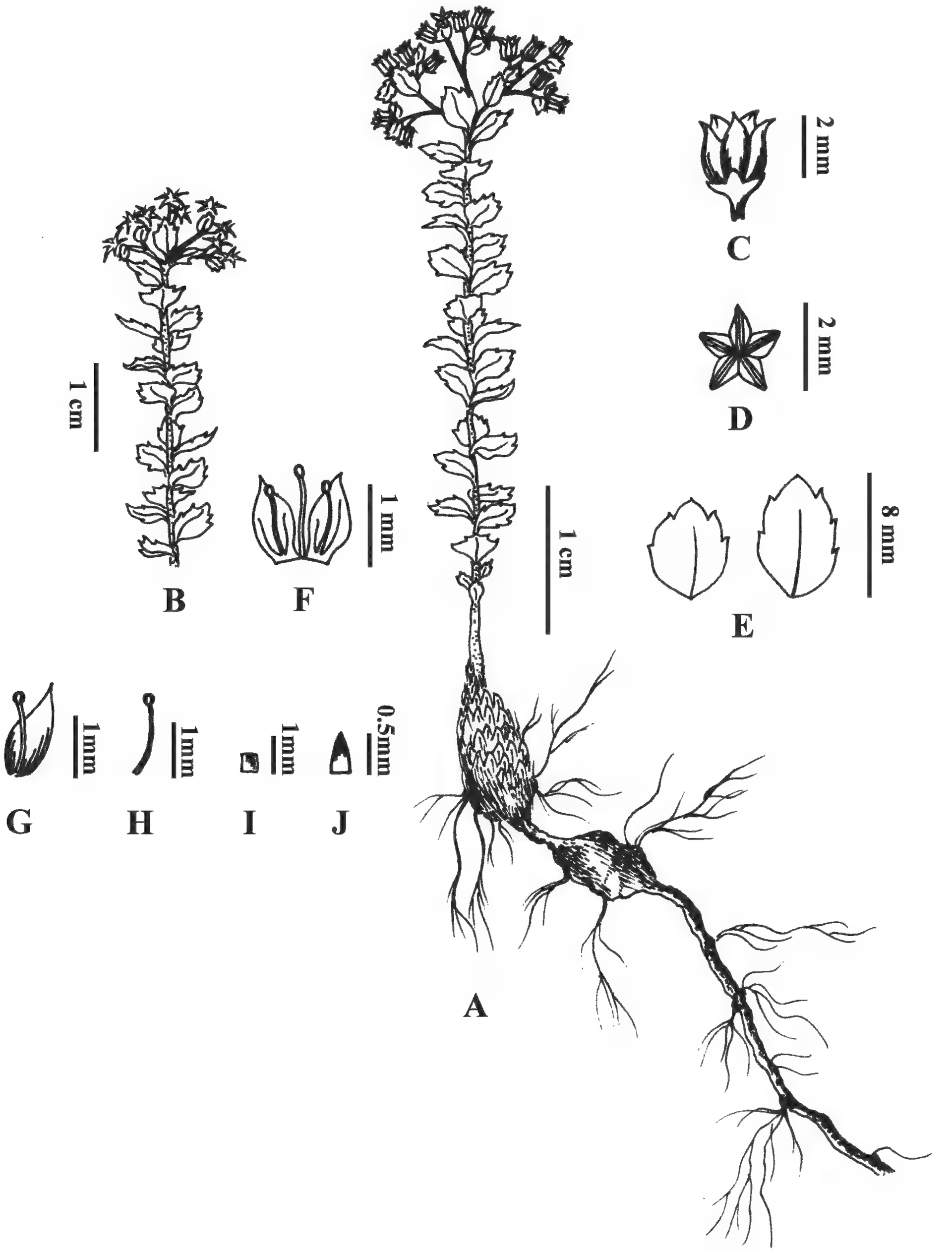

Figure 1. *Rhodiola wenchuanensis* Tao Li & Hao Zhang. —A. Fertile habit (♀). —B. Fertile habit (♂). —C. Fruit. —D. Fruit, viewed from above. —E. Leaves. —F. Partial corolla with three stamens. —G. Partial corolla with one stamen. —H. Stamen. —I. Squamule. —J. Sepal of staminate flower. Drawn from the holotype *T. Li 060707* (WCU).

Distribution and habitat. The new species was found in the Qinghai-Tibetan Plateau on Balang Mountain (Wenchuan County) and Jiajin Mountain (Baoxing County), both in western Sichuan Province, China. In 2006 and 2007, *Rhodiola wenchuanensis* was collected from mountain slopes, grasslands, alpine meadows, and rock crevices, from altitudes ranging from 3600 to 3700 m. Thus far, three populations totaling about 600 individual plants have been found; of these, ca. 300 individual plants were found at the type locality.

IUCN Red List category. According to the current knowledge of the species, *Rhodiola wenchuanensis* is

Table 1. Morphological comparison of the diagnostic characteristics of *Rhodiola wenchuanensis* with the related species *R. discolor*.

Characters	*R. wenchuanensis*	*R. discolor*
Stem	2.5–9 cm high	12–40 cm high
Stem and pedicel	densely puberulent with unicellular simple trichomes	glabrous
Leaf margin	obviously bidentate or tridentate on each side, not revolute	entire or inconspicuous, revolute
Leaf shape	ovate-elliptic or ovate	ovate-lanceolate or linear-lanceolate to ovate
Petiole	absent	present, ca. 1 mm long
Midrib	not convex abaxially	distinctly convex abaxially
Inflorescence	2- to 16-flowered, 0.4–1.8 × 0.6–3 cm	10- to 82-flowered, 3–5 × 5–10 cm
Sepal	crimson (S, P); ca. 0.5 mm (S); ca. 0.8 mm (P)	green (S); green or with pale red (P); 1–2.5 mm (S, P)
Petal	crimson (S, P); 1.1–1.5 × 0.6–1 mm (S); ca. 1.2 × 0.3 mm (P)	pale red, 5–6 × 1.7–2 mm (S); green or with pale red, 3–4 × 0.9–1.2 mm (P)
P:S	≤ 1	2.5–4
Carpel	undeveloped (S)	erect development (S)
Fruit	crimson	green with purplish red at the apex

P, pistillate flower; P:S, length ratio of petal to stamen; S, staminate flower.

restricted to high mountains in western Sichuan Province, where three populations have been discovered in two localities; only one locality is currently within a national conservation area (Wolong National Natural Reserve). The species should be considered Endangered (EN) according to IUCN Red List criteria (IUCN, 2001), because the two localities on the Qinghai-Tibetan Plateau where it has been found are likely to suffer human disturbance due to increasing travel along the roads of Balang Mountain (Wenchuan County) and thriving tourism on Jiajin Mountain (Baoxing County). In addition, the species may be affected by excessive grazing on the alpine meadows and by a gradual decline in the areas of available habitat. Strict conservation measures to safeguard the three known populations are urgently needed.

Phenology. Flowering was observed to occur in June and July, with fruiting in July and August.

Etymology. The specific epithet is derived from the type locality in Wenchuan County, Sichuan Province, China.

Affinities. *Rhodiola wenchuanensis* is assigned as a fourth species to *Rhodiola* sect. *Rhodiola* ser. *Bupleuroides* (Frodin) S. H. Fu, with three species previously known worldwide; all four of the species of series *Bupleuroides* are distributed in the Qinghai-Tibetan Plateau in western Sichuan Province, China. Taxa in series *Bupleuroides* have isomorphic, membranous scale leaves; stems single or rarely few per plant; alternate leaves; an inflorescence in a terminal corymb; dioecious plants with unisexual flowers and four or five erect, shortly oblong carpels; and the carpel with an apex that is not revolute, a broad base, and a length to width ratio of 2:1. Two species previously known for series *Bupleuroides*, *R. purpureoviridis* (Praeger) S. H. Fu and *R. bupleuroides* (Wall. ex Hook. f. & Thomson) S. H. Fu, distinctly differ from *R. wenchuanensis* in the rhizome shape (obconic vs. linear in *R. wenchuanensis*), thickness (ca. 2 cm and ca. 3 cm, respectively, vs. ca. 4 mm diam. in *R. wenchuanensis*), and orientation (erect vs. horizontal in *R. wenchuanensis*); leaf shape (oblong-lanceolate and obovate-rotund, respectively, vs. ovate-elliptic in *R. wenchuanensis*); follicle length (ca. 6 mm and 4–10 mm, respectively, vs. ca. 2.5 mm in *R. wenchuanensis*); plant stature (15–40 cm and 5–60 cm, respectively, vs. 2.5–9 cm in *R. wenchuanensis*); and larger sepals and petals. The most closely related species with a morphology similar to the new taxon appears to be *R. discolor*, also within series *Bupleuroides*, which is sympatric with the new species in Sichuan Province. Both species share slender rhizomes; dioecious plants with the pistillate flowers with four or five erect, shortly oblong carpels with the apex not revolute and base broad; and flowers occurring in terminal corymbs. The new species *R. wenchuanensis* differs from *R. discolor* in its smaller stature (2.5–9 cm vs. 12–40 cm); densely puberulent stems and pedicels (vs. glabrous); the leaf margins obviously dentate and not revolute (vs. entire and revolute); the ratio of petal to stamen length less than or equal to 1 (vs. 2.5–4× longer); the crimson sepals, petals, and ripe fruits (vs. green with purplish red only at the apex); the carpels undeveloped in the staminate flowers (vs. developed); and the sessile leaves (vs. petiole ca. 1 mm long). A detailed comparison of *R. wenchuanensis* and *R. discolor* is provided in Table 1. Through additional fieldwork, we found plants of *R. wenchuanensis* to

have a stable, predictable set of morphological characters that recur in several distinct populations.

Paratypes. CHINA. **Sichuan:** Wenchuan Co., Mt. Balang, 10 July 2006, *T. Li 06071001* (WCU); Baoxing Co., Mt. Jiajin, 15 July 2007, *T. Li 07071501* (WCU).

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Lectotypification of *Actinidia latifolia* var. *deliciosa* (Actinidiaceae)

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ABSTRACT. A lectotype is designated for *Actinidia latifolia* (Gardner & Champ.) Merr. var. *deliciosa* A. Chev. (Actinidiaceae), selecting the second plate from the Chevalier protologue. *Actinidia latifolia* var. *deliciosa* is the basionym for the well-known kiwifruit *A. deliciosa* (A. Chev.) C. F. Liang & A. R. Ferguson.

Key words: *Actinidia*, Actinidiaceae.

Auguste J. B. Chevalier (1940) described *Actinidia latifolia* (Gardner & Champ.) Merr. var. *deliciosa* A. Chev. from the plant cultivated in the Jardin des Plantes, Paris. Chevalier soon recognized that the variety belonged to *A. chinensis* Planch. and proposed the new combination in 1941 as *A. chinensis* var. *deliciosa* (A. Chev.) A. Chev. Liang (1975) described *A. chinensis* var. *hispida* C. F. Liang, which proved to be the same taxon as *A. chinensis* var. *deliciosa* (Liang & Ferguson, 1984, 1986; Ferguson, 1990). Gui (1981) was the first to point out that the morphological distinction between *A. chinensis* var. *deliciosa* and the autonymic variety justified specific separation. Although Liang (1982) stressed that *A. chinensis* var. *deliciosa* should not be given specific status, Liang and Ferguson (1984, 1986) did raise it to the rank of species in the new combination *A. deliciosa* (A. Chev.) C. F. Liang & A. R. Ferguson. From then on, it has been hotly debated whether the two taxa are two distinct species or not (Ferguson, 1990; Xiong, 1991; Webby et al., 1994; Hirsch et al., 2002; Huang et al., 2002; Chat et al., 2004; Jia et al., 2005; J. Q. Li et al., 2007; Z. Z. Li et al., 2007). However, the type has remained ambiguous until now.

The two taxa are very similar to each other. The main differences between *Actinidia chinensis* var. *chinensis* and *A. chinensis* var. *deliciosa* are that the former has young branchlets and petioles that are white pubescent to roughly tomentose, glabrous to glabrate when mature, and fruits that are densely tomentose, but soon glabrous. In variety *deliciosa*, the young branchlets and petioles are brownish strigose, with the hairs not easily lost, and the fruits are densely hispid, more or less hispid when mature (J. Q. Li et al., 2007). *Actinidia chinensis* var. *deliciosa* is mainly distributed in western mainland China, whereas *A. chinensis* var. *chinensis* is found further to the east (Liang, 1975; Ferguson, 1990; J. Q. Li et al., 2007). The plants are of great economic importance, because their fruits, well-known as kiwifruit, are popular all over the world. More than 120,000 ha. of orchard are planted with the two taxa, with an annual production exceeding 1.35 million tons of fresh fruit (Ferguson & Huang, 2007).

The taxonomy of *Actinidia chinensis* var. *chinensis* and *A. chinensis* var. *deliciosa* needs further revision based on extensive population sampling across their entire geographic range, with careful observation of the variation of morphological characters and investigation of genetic variation using molecular markers. However, when *A. latifolia* var. *deliciosa* was published, no specimen was selected as a type (Chevalier, 1940). We suspected that perhaps Chevalier had preserved a specimen in the Muséum National d'Histoire Naturelle (P), since the plant was cultivated in the Jardin des Plantes in Paris. Dr. Joël Jérémie kindly helped in searching through the specimens at P identified as *A. latifolia* var. *deliciosa*, in particular for specimens annotated by Auguste Chevalier, but no type specimen was ever discovered. We therefore think that it is necessary to designate a type. There are two illustrations in the protologue of *A. latifolia* var. *deliciosa* (Chevalier, 1940). The first one shows the whole liana growing against a wall in the Jardin des Plantes. The second plate (Chevalier, 1940: 15, planche II; our Fig. 1) shows a fruiting branch alongside detached fruits (one bisected longitudinally). This plate is referenced by Chevalier at the end of his description (Chevalier, 1940: 14) and is easily recognizable as *A. latifolia* var. *deliciosa* (i.e., *A. chinensis* var. *deliciosa*). Plate 2 clearly displays the characters distinguishing *A. latifolia* var. *deliciosa* from *A. latifolia*, i.e., the orbicular leaf blade with a subcordate base and an almost rounded apex; the fruiting branch with one to two fruits per infructescence; and fruits that are ellipsoid or ovoid and hispid, with reflexed persistent sepals and long pedicels. In contrast, the infructescence of *A. latifolia* has many glabrous fruits when mature. According to Articles 9.2, 9.9, and 9.10 of the *International Code of*

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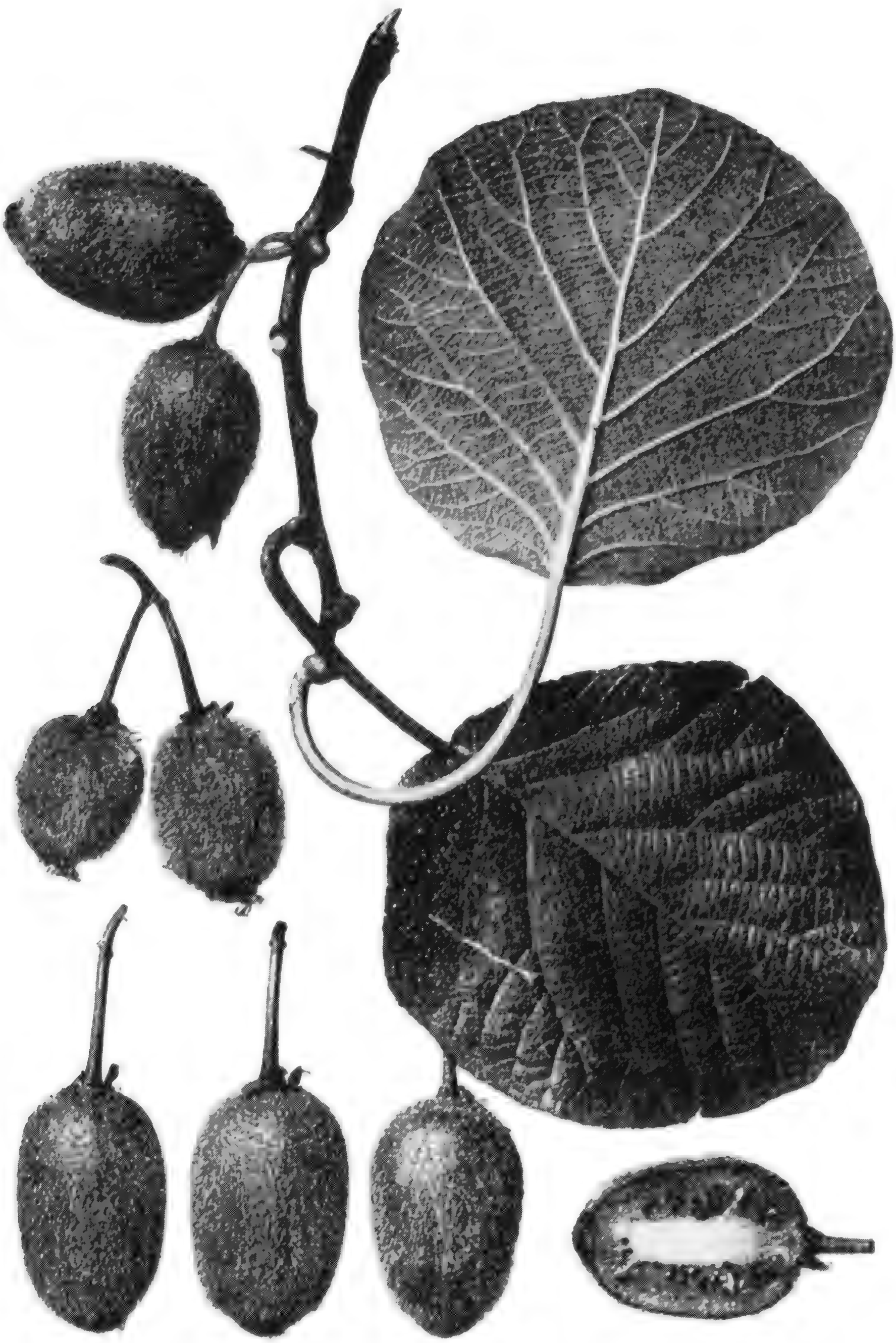

Figure 1. Lectotype of *Actinidia latifolia* (Gardner & Champ.) Merr. var. *deliciosa* A. Chev. The original caption read "Fructification du même" (Chevalier, 1940: 15, pl. 2).

Botanical Nomenclature (McNeill et al., 2006), we here designate this second illustration as the lectotype of *A. latifolia* var. *deliciosa*.

Actinidia latifolia (Gardner & Champ.) Merr. var. **deliciosa** A. Chev., Rev. Bot. Appl. Agric. Trop. 20: 12. 1940. TYPE: "Fructification du même," Planche II in Chevalier, 1940 (lectotype, designated here, Pl. 2 in Chevalier, 1940: 15). EPITYPE: China. Hubei: Wufeng, 2 Aug. 1959, *R. H. Huang 1991* (epitype, HIB). Figure 1.

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Heterostemma pingtaoi (Apocynaceae, Asclepiadoideae), a New Species from Hainan, China

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ABSTRACT. *Heterostemma pingtaoi* S. Y. He & J. Y. Lin (Apocynaceae, Asclepiadoideae) is described from Hainan Province, China. The new species is morphologically similar to *H. oblongifolium* Costantin in its leaf blade with an acute apex and rounded base. In comparison, *H. pingtaoi* differs from *H. oblongifolium* in its pubescent petioles (vs. glabrous), the leaves only to 7.3 cm long (vs. 7.5–14 cm), the five calyx glands (vs. 10), and the corolla externally pubescent and yellow-green with mauve pubescence (vs. green and glabrous).

Key words: Apocynaceae, Asclepiadoideae, China, Hainan, *Heterostemma*, IUCN Red List.

Heterostemma Wight & Arn. has been considered to be a genus of ca. 10 species in India and Malaysia, with five species in India (Hooker, 1885; Costantin, 1912). The genus has up to 12 species in India, China, Southeast Asia, Malesia, and Melanesia, with two native species in Australia, one of which is endemic (Forster, 1996). Tsiang and Li in their 1977 account of *Heterostemma* recognized 11 species occurring in China. Li et al. (1995) later accepted about 30 species for the genus, distributed from China, India, Indonesia, Laos, Malaysia, Burma (Myanmar), Nepal, New Guinea, the Philippines, Sri Lanka, Thailand, and Vietnam, as well as Australia; of these, nine species are found in China, most in Yunnan, Guangxi, and Hainan provinces, where there are seven, six, and five species, respectively. Subsequently, Chen and Li (1998) compared treatments of *Heterostemma* in the 1977 volume of the *Flora Reipublicae Popularis Sinicae* (Tsiang & Li, 1977) with the 1995 volume of the later *Flora of China* (Li et al., 1995) and accepted a tenth species, *H. alatum* Wight, for China. An eleventh taxon, *H. lobulatum* Y. H. Li & Konta was discovered in Xishuangbanna in Yunnan Province (Li et al., 2002). During an expedition to Jianfengling in Hainan Province in autumn 2006, the authors collected a distinctive specimen of *Heterostemma*. Careful comparison with morphologically similar specimens in Chinese herbaria (HITBC, IBSC, and KUN) and our survey of the taxonomic literature support its recognition as a twelfth and new species for the Chinese flora.

Heterostemma pingtaoi S. Y. He & J. Y. Lin, sp. nov.
TYPE: China. Hainan: Jianfengling, 18°44′N, 108°50′E, on rocks in montane rainforest, 1039 m, 27 July 2006, *Shao-yun He, Ping-tao Li & Jia-yi Lin 607271* (holotype, CANT). Figure 1.

Species nova *Heterostemmati oblongifolio* Costantin affinis, a quo lamina foliari 4.5–7.3 cm (vs. 7.5–14 cm) longa, petiolo pubescenti (vs. glabro), corolla externe pubescenti, flavovirenti et malvettina (vs. glabra, viridi), et glandibus calycis 5 (vs. 10) differt.

Twining vines, stems terete to 5 m, with 2 ranks of hairs. Petiole 0.5–1.5 cm, pubescent, leaves opposite, elliptical to oblong, 4.5–7.3 × 1.5–3.3 cm, papery, round to broadly cuneate at base, apex obtuse; basal veins 3 to 5, lateral veins in 6 to 9 pairs; midrib winged abaxially, green adaxially, light green abaxi-

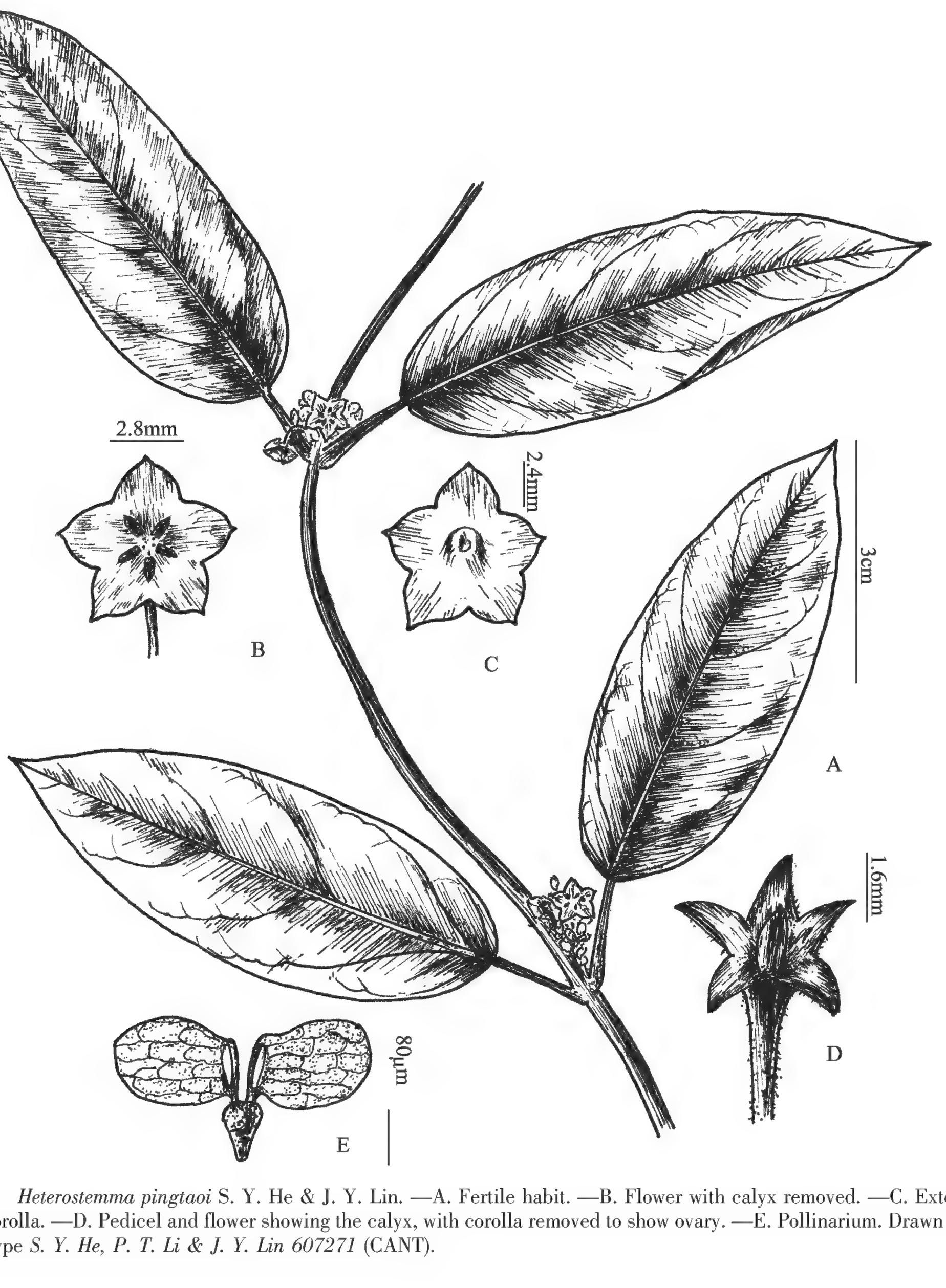

Figure 1. *Heterostemma pingtaoi* S. Y. He & J. Y. Lin. —A. Fertile habit. —B. Flower with calyx removed. —C. External view of corolla. —D. Pedicel and flower showing the calyx, with corolla removed to show ovary. —E. Pollinarium. Drawn from the holotype *S. Y. He, P. T. Li & J. Y. Lin 607271* (CANT).

ally. Inflorescences extra-axillary, umbel-like, up to 3- to 6-flowered; peduncle 0.6–0.8 cm; pedicels 5–6 mm. Sepals oblong to triangular, ca. 1.6–1.8 × 1.3–1.5 mm, densely pubescent throughout; calyx with 5 glands at sinus bases, corolla lobes oblong to ovate, 3.5–4 × 1.5–2 mm, 7–7.5 mm diam., internally yellow with orange, externally yellow-green with mauve, pubescent; corona apex almost acute; pollinia oblong. Stigma head oblong. Fruit and seed unknown.

Distribution and ecology. *Heterostemma pingtaoi* is only known from the holotype and three other specimens collected from a small area in Jianfengling, Hainan Province. It was noted to grow on trees or rocks, in the woods, at altitudes from 1000 to 1100 m. The new species was associated with *Syzygium globiflorum* (Craib) P. Chantanaranothai & J. Parnell, *Hoya griffithii* Hook. f., *Oreocnide rubescens* (Blume) Miq., *Schefflera heptaphylla* (L.) Frodin, *Ficus tinctoria* subsp. *gibbosa* (Blume) Corner, *Lindera glauca* (Siebold & Zucc.) Blume, *Scindapsus maclurei* (Merr.) Merr. & F. P. Metcalf, *Alocasia macrorrhizos* (L.) G. Don, *Neottopteris nidus* (L.) J.

Table 1. Diagnostic characters of *Heterostemma pingtaoi* S. Y. He & J. Y. Lin and two morphologically similar species.

Characters	*H. pingtaoi*	*H. oblongifolium*	*H. esquirolii*
Petiole (cm)	0.5–1.5, pubescent	1.2–3(–4.5), glabrous	1.3–2.3(–5), pubescent
Leaf shape	elliptical or oblong	oblong or rarely ovate to oblong	ovate or elliptic-ovate
Leaf apex	acute	acute	acuminate
Leaf base	rounded	rounded	cuneate or slightly cordate
Blade length (cm)	4.5–7.3	7.5–14(–17.5)	(4–)6.5–10(–12)
Blade width (cm)	1.5–3.3	(2.8–)3.5–5.4(–7)	2–6.5
Pairs of lateral veins on leaf blade	6 to 9	5 to 7	3 to 4
Peduncle (cm)	0.6–0.8	1–2	1.5–3(4)
No. of flowers per inflorescence	3 to 6	4 to 5	10 to 17
Corolla internal surface	yellow with orange	yellow or orange	yellow or orange
Corolla external surface	yellow-green with mauve, pubescent	green, glabrous	not described, glabrous
Calyx glands	5	10	5
Distribution	Jianfengling, Hainan	Yunnan, Guangdong, Guangxi, Hainan	Guangdong, Guizhou, Yunnan

Sm., and *Alpinia zerumbet* (Pers.) B. L. Burtt & R. M. Sm.

IUCN Red List category. *Heterostemma pingtaoi* should be considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001) because it is known from only a single collection and thus remains in need of further investigation against future conservation efforts.

Phenology. The new species was observed to flower from July to August.

Etymology. The specific epithet honors the eminent botanist Ping-tao Li of South China Agricultural University, an expert in the Apocynaceae of China.

Discussion. *Heterostemma pingtaoi* closely resembles *H. oblongifolium* Costantin and *H. esquirolii* (H. Lév.) Tsiang. However, the new species differs from *H. oblongifolium* in its pubescent petioles (vs. glabrous), the leaves only to 7.3 cm long (vs. 7.5–14 cm), the five calyx glands (vs. 10), and the corolla externally pubescent and yellow-green with mauve pubescence (vs. green and glabrous). It differs from *H. esquirolii* in its elliptical or oblong leaves (vs. ovate or elliptic-ovate), the leaf blade rounded at the base (vs. cuneate or slightly cordate), six to nine pairs of lateral veins (vs. three to four pairs), and the externally pubescent corolla (vs. glabrous) (Table 1).

Paratypes. CHINA. **Hainan:** Jianfengling, 18°44′N, 108°50′E, on rocks in montane rainforest, 1039 m, 27 July 2006, *S. Y. He, P. T. Li & J. Y. Lin 607272, 607273, 607274* (CANT).

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Nomenclatural and Taxonomic Novelties in *Senecio* ser. *Corymbosi* (Asteraceae, Senecioneae) from Southern South America

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Abstract. The new name, subseries *Alcabrerae* M. G. López, A. F. Wulff & Xifreda for *Senecio* L. ser. *Corymbosi* (Cabrera) Cabrera, is here proposed to replace *Senecio* subsect. *Amplectentes* Cabrera. Although the name *Amplectentes* was published at different subgeneric ranks within the genus *Senecio* (Asteraceae, Senecioneae), the use of the same epithet is considered homonymy according to the *International Code of Botanical Nomenclature*, Article 53.4 and Article 21, Note 1. Additionally, *S. saucensis* Cabrera, one of the five species belonging to *Senecio* subser. *Alcabrerae*, is synonymized with *S. toroanus* Cabrera, formerly assigned to *Senecio* ser. *Hualtatini* DC., and *S. toroanus* is transferred to subseries *Alcabrerae*. The micromorphology of the cypselae for both species is provided, in support of the synonymy.

Resumen. El nuevo nombre para la subseries *Alcabrerae* M. G. López, A. F. Wulff & Xifreda de *Senecio* L. ser. *Corymbosi* (Cabrera) Cabrera se propone aquí en reemplazo de *Senecio* subsect. *Amplectentes* Cabrera. A pesar de que el mismo nombre *Amplectentes* fue publicado en rangos subgenéricos diferentes dentro del género *Senecio* (Asteraceae, Senecioneae), el uso del mismo epíteto es considerado homonimia según el *Código Internacional de Nomenclatura Botánica*, Artículo 53.4 y Artículo 21, Nota 1. Además, *S. saucensis* Cabrera, una de las cinco especies pertenecientes a *Senecio* subser. *Alcabrerae* se sinonimiza aquí con *S. toroanus* Cabrera, originalmente tratada bajo *Senecio* ser. *Hualtatini* DC., y *S. toroanus* es aquí transferida a subser. *Alcabrerae*. Se aporta la micromorfología de las cipselas de ambas especies, reforzando la sinonimización.

Key words: Argentina, Asteraceae, Chile, *Senecio*, ser. *Corymbosi*, subser. *Amplectentes*.

Multidisciplinary studies on Asteraceae have been ongoing for several years on taxa from southern South America, mainly of Argentine origin. New research focusing on *Senecio* L. in the Senecioneae (López, 2008) has revealed the nomenclatural illegitimacy and taxonomic synonymy of representatives within *Senecio* ser. *Corymbosi* (Cabrera) Cabrera (Cabrera, 1985; Cabrera et al., 1999). The results presented here include nomenclatural and taxonomic novelties at the subserial and specific level within *Senecio* ser. *Corymbosi*.

A New Name for *Senecio* subser. *Amplectentes* within Series *Corymbosi*

The epithet *Amplectentes* denominated an infrageneric rank in the genus *Senecio* and was first used by Greenman (1902) to delimit a distinctive group of species with stems erect or ascending and leafy to the inflorescences, pubescence usually of long jointed hairs, amplexicaul stem leaves, and calyculate involucre. The name was validated by its description in the key (Greenman, 1902: 18). The epithet *Amplectentes* was published by Greenman at the rank of section and applied to 29 *Senecio* species from the United States and Mexico. The type species for the section was not designated by the author; however, in accordance with Article 22.6 of the *International Code of Botanical Nomenclature* (ICBN; McNeill et al., 2006), *S. amplectens* A. Gray (1862) is the implicit type, as the name of the section clearly derives from

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the epithet of one species assigned to it. Later, Greenman (1915: 577) used the name *Amplectentes* again in a synopsis of the subgenera and sections of *Senecio* at the rank of section, in a monograph of the North and Central American species. Only 10 of 29 species considered by Greenman are currently accepted (Barkley, 2006). On the other hand, Cabrera (1949) used the same name *Amplectentes* within the genus *Senecio*, attributing this to himself, for one of seven subsectional groups pertaining to section *Corymbocephalus* Cabrera. This name was later reduced to the rank of subseries as subseries *Amplectentes* (Cabrera) Cabrera & S. E. Freire (Cabrera et al., 1999) affiliated with the series *Corymbosi* [= section *Corymbosi* Cabrera (Cabrera, 1939), with this name found to have priority over section *Corymbocephalus* (Cabrera, 1949)].

Additionally, the name *Amplectentes* was ambiguously cited in the botanical literature, sensu both Greenman (1902, 1915) and Cabrera (1949). Among others, Ornduff et al. (1967: 217, 210) postulated basic chromosome numbers for sections of *Senecio* in North America and included section *Amplectentes* Greenman with a base number of 20; today $x = 5$ is the accepted basic chromosome number for the genus (López et al., 2005, 2008). A different taxonomic view was followed by Barkley (1985: 216–217), who assigned some species previously included under section *Amplectentes* sensu Greenman to his informal group Herbacei and subgroups Triangulares and Lugentes. Section *Amplectentes* was later recognized separately again as a "group" (Barkley, 2006: 544, 546) and included 10 species. Jeffrey (1988: 85, 86) annotated both authorities differently as "sect. *Corymbosi* Cabr. subsect. *Amplectentes* Cabr." as "perennial leafy-stemmed herbs or subshrubs; upper leaves semiamplexicaul," and "sect. *Amplectentes* Greenm." as "perennial subscapigerous herbs; upper semiamplexicaul," recognizing Barkley's Triangulares and Lugentes as separate informal groups.

The infrageneric name *Amplectentes* Greenman (Greenman, 1902) has priority over *Amplectentes* Cabrera (Cabrera, 1949). Despite the fact that the same name was published at two different ranks (sectional and subsection/subseries, respectively), they are considered homonyms under the ICBN (McNeill et al., 2006: Art. 53.4, Art. 21, Note 1). Consequently, a replacement name is proposed here for subseries *Amplectentes* within *Senecio* ser. *Corymbosi*. This series was previously published at the level of section, as has been previously noted.

Senecio L. ser. **Corymbosi** (Cabrera) Cabrera, Darwiniana 26: 157. 1985. Basionym: *Senecio* sect. *Corymbosi* Cabrera, Lilloa 5: 71. 1939. TYPE: *Senecio brasiliensis* (Spreng.) Less.

Senecio L. subser. **Alcabrerae** M. G. López, A. F. Wulff & Xifreda, nom. nov. Replaced synonym: *Senecio* subsect. *Amplectentes* Cabrera, Lilloa 15: 355. 1949, nom. illeg. non *Senecio* sect. *Amplectentes* Greenman, 1902. *Senecio* subser. *Amplectentes* (Cabrera) Cabrera & S. E. Freire, Fl. Fanerog. Argent. 62: 22. 1999. TYPE: *Senecio hieracium* J. Rémy (designated by Cabrera, 1949: 355).

Observations. Subseries *Alcabrerae* in *Senecio* sect. *Senecio* ser. *Corymbosi* has been circumscribed, recognizing five species from Chile (Cabrera, 1949) and Argentina (Cabrera et al., 1999): *S. hieracium*, *S. saucensis* Cabrera, *S. prenanthifolius* Phil., *S. nigrescens* Hook. & Arn., and *S. scopulorum* Poepp. *Senecio toroanus* Cabrera may be added to this list as a new synonym for *S. saucensis*. The synonymy with the taxonomic transfer of series is provided below.

Synonymy of *Senecio saucensis* with *S. toroanus*

Senecio ser. *Hualtatini* was described by de Candolle (1838: 417) to include robust perennial herbs, from high to giant forms with fistulose stems. The fleshy, basal leaves are largely petiolate, forming a rosette, and the upper leaves are semiamplexicaul. The majority of these characteristics are not present in *S. toroanus*, which was included in series *Hualtatini* (Cabrera et al., 1999) on the basis of the inflorescence that is a corymbiform cyme and the presence of ray florets. However, *S. toroanus* differs from other taxa in series *Hualtatini* in being only 50 cm tall, lacking both fistulose stems and fleshy leaves, not forming rosettes, having leafy stems, and having leaves that are small, thin, and irregular in shape. These features support the exclusion of this species from series *Hualtatini*.

Recent investigation of the micromorphological ornamentation of fruits of the Argentine representatives of *Senecio* ser. *Hualtatini* (López, 2005) showed that the series is defined by glabrous cypselae. *Senecio toroanus*, however, displays pubescent and papillate fruits, which further supports that the species has been placed in series *Hualtatini* erroneously. Further research by us in *Senecio* ser. *Corymbosi*, with comparison with series *Hualtatini*, reveals morphological and micromorphological similarities between *S. toroanus* and *S. saucensis*, which belongs to *Senecio* ser. *Corymbosi* subser. *Alcabrerae*. Analysis of the relevant type specimens (Fig. 1) and the evaluation of the cypsela micromorphology (Fig. 2) confirm that the names are conspecific; hence, the formal proposal is indicated below. As a

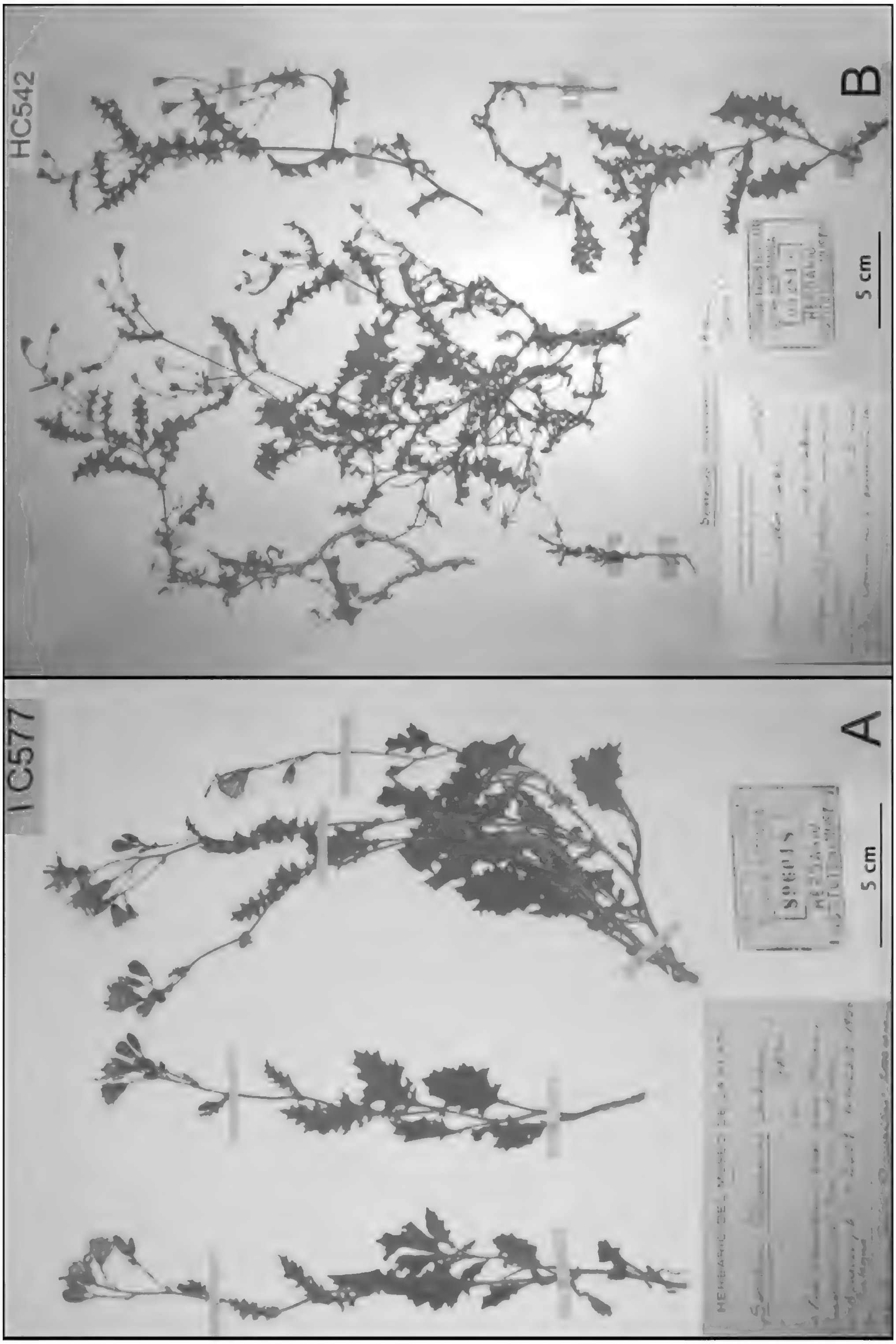

Figure 1. Type specimens. —A. *Senecio toroanus* Cabrera (isotype, *Cuezzo & Balegno 2001*, LP). —B. *Senecio saucensis* Cabrera (holotype, *Parodi 14836*, LP).

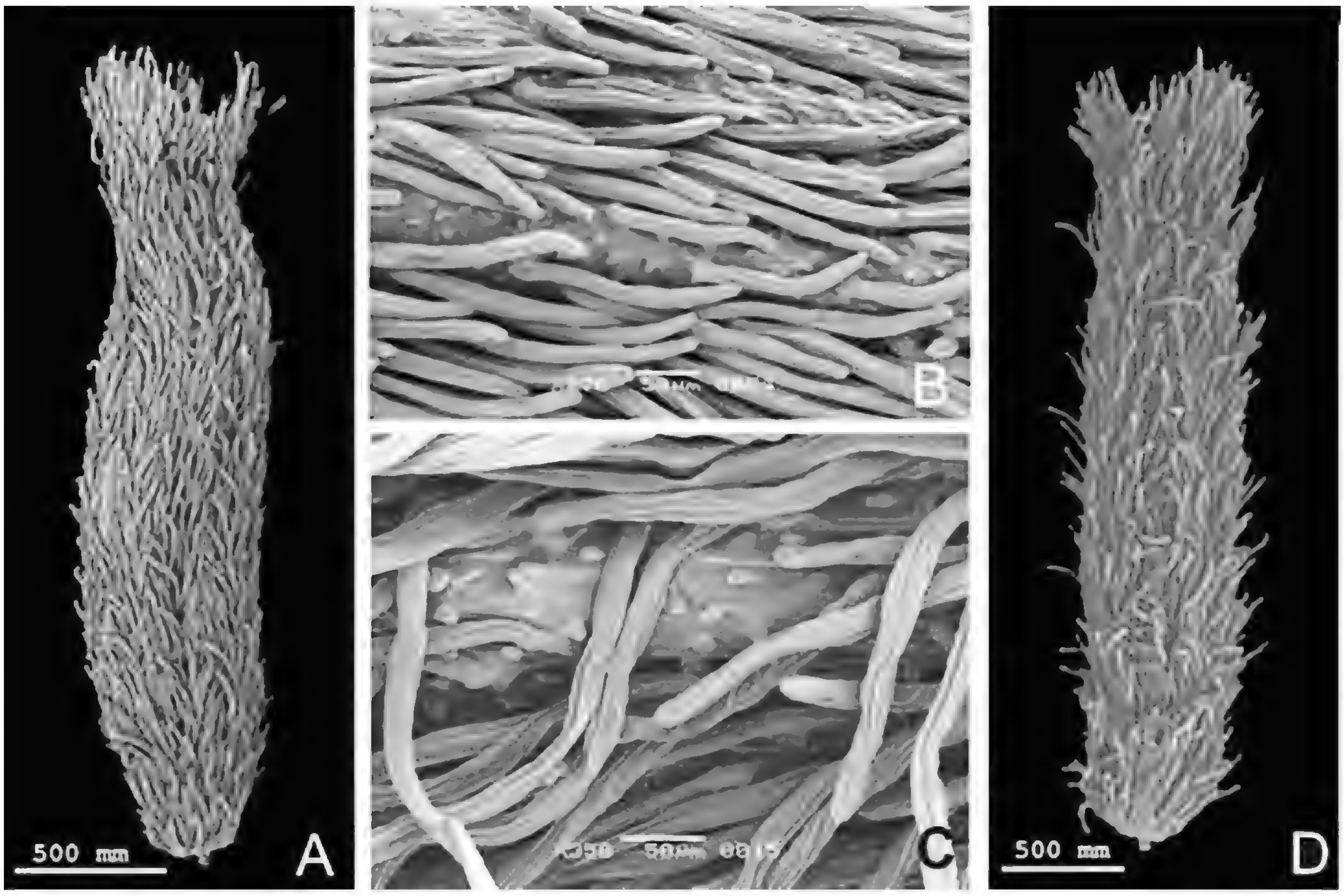

Figure 2. SEM fruit micromorphology. A, B. *Senecio saucensis*. —A. Pubescent cypsela (Argentina, Prov. Catamarca, Tinogasta, *F. A. Roig 15427*, SI). —B. Ornamentation of pubescent cypselar surface with papillae also evident (Argentina, Prov. La Rioja, Dept. Capital, Dique Los Sauces, *A. Burkart 12627*, LP). C, D. *Senecio toroanus* (Argentina, Prov. Mendoza, Dept. Las Heras, Quebrada del Toro, *G. Covas 18570*, SI). —C. Pubescent cypsela. —D. Surface ornamentation.

consequence of this taxonomic synonymy, the geographic distribution of *S. toroanus* is extended, with its distributional range in the Argentine mountains of Catamarca, La Rioja, San Juan, and Mendoza provinces, between 2000 and 2700 m in altitude.

Senecio toroanus Cabrera, Darwiniana 10(4): 573, fig. 11. 1954. TYPE: Argentina. Mendoza: Dept. Las Heras, Quebrada del Toro, El Centinela, 2000 m, 21 Jan. 1950, *A. Cuezzo & B. Balegno 2001* (holotype, LIL not seen; isotype, LP). Figure 1A.

Senecio saucensis Cabrera, Bol. Soc. Argent. Bot. 11(1): 53, fig. 5. 1966, syn. nov. TYPE: Argentina. La Rioja: Dept. Capital, Dique Los Sauces, 16 Feb. 1944, *L. Parodi 14836* (holotype, LP). Figure 1B.

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Blechnum yungense (Pteridophyta, Blechnaceae), una Nueva Especie de Argentina y Bolivia

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Resumen. Una nueva especie *Blechnum yungense* Ramos Giacosa (Pteridophyta, Blechnaceae), la cual se distribuye en Argentina y Bolivia se describe e ilustra a partir de material de Jujuy, Argentina. Este nuevo taxón es semejante a *B. schomburgkii* (Klotzsch) C. Chr. del cual difiere por las características de las pinnas, reducción basal de la lámina y ornamentación de las esporas. Ambos taxones están incluidos en la sect. *Lomariocycas* (J. Sm.) C. V. Morton del género *Blechnum* L.

Abstract. The new species *Blechnum yungense* Ramos Giacosa (Pteridophyta, Blechnaceae), distributed in Argentina and Bolivia, is described from Jujuy, Argentina, and illustrated. The new taxon resembles *B. schomburgkii* (Klotzsch) C. Chr., but it differs in the pinnae, the basal reduction of the lamina, and the spore ornamentation. Both taxa are included in *Blechnum* L. sect. *Lomariocycas* (J. Sm.) C. V. Morton.

Key words: Argentina, *Blechnum*, Bolivia, IUCN Red List, sect. *Lomariocycas*.

El género *Blechnum* L. (Pteridophyta, Blechnaceae) es un género cosmopolita con alrededor de 150–200 especies y para América se citan cerca de 50 especies. Este género está pobremente representado en las regiones templadas del Hemisferio Norte, pero es muy rico en las regiones templadas del Hemisferio Sur, en zonas tropicales, áreas subandinas y en islas oceánicas (Tryon & Tryon, 1982; Kramer et al., 1990). Para Bolivia, Foster (1958) mencionó la presencia de 25 taxones de *Blechnum* y Rolleri y Prada (2006) citan alrededor de 30. Posteriormente, Kessler et al. (2007) mencionan la presencia de 10 taxones más para ese país. Para Argentina, se citan 20 taxones (Ponce, 1996; Durán, 1997), la mayoría de los cuales crece en el noroeste del país.

Blechnum sect. *Lomariocycas* (J. Sm.) C. V. Morton, fue propuesta sin tipificación por J. Smith (1875) cuando *Blechnum* era considerado parte del género *Lomaria* Willd. Posteriormente, esta sección fue tipificada e incluida dentro del género *Blechnum* por Morton (1959). Este autor caracterizó a la sección por poseer rizomas arborescentes y escamas bicoloras, curvadas, enteras y pluriestratificadas en el rizoma y la base del pecíolo. La sección *Lomariocycas* fue incluida por Tryon y Tryon (1982) en el grupo *B. buchtienii* Rosenst.

Como parte de la revisión sistemática de la sect. *Lomariocycas* en América (Ramos Giacosa, 2008), se estudió material de herbario, material tipo y fototipos. Un cuidadoso análisis del material permitió evidenciar la presencia de una nueva especie de *Blechnum*, la cual se describe, ilustra y se la compara con la afín *B. schomburgkii* (Klotzsch) C. Chr.

Blechnum yungense Ramos Giacosa, sp. nov. TIPO: Argentina. Prov. Jujuy: Dpto. Ledesma, Camino a Valle Grande, 12 sep. 1971, *P. R. Legname & A. R. Cuezzo 8609c* (holotipo, LP; isotipos, CTES, LIL). Figuras 1–3.

Haec species *Blechno schomburgkii* (Klotzsch) C. Chr. affinis, sed ab eo laminis basim basim abrupte reductis, pinnis medianis majoribus perpendicularibus atque sporis plicis valde porcatis ornatis differt.

Plantas terrestres; rizomas erectos, arborescentes, 30 cm diám.; escamas del rizoma 2–3 × 1.5–2 cm, lineares a aciculares, rígidas, basifijas, marrones oscuras a negras, con márgenes enteros, la parte central pluriestratificada y márgenes uniestratificados. Frondes estériles y fértiles dimorfas. Frondes estériles 50–90 × 15–25 cm; pecíolos 15–30 cm, marrón claros, surcados adaxialmente, con escamas similares a las del rizoma; láminas 35–60 cm, elípticas a lanceoladas, 1-pinnadas, coriáceas, abruptamente reducidas hacia la base; pinnas 8–12 × 1.6–2.4 cm, 14 a 30 pares, distantes, linear-lanceoladas, bases agudas a cuneadas, ápices agudos, márgenes enteros, ligeramente revolutos, perpendiculares al raquis a ascendentes, las basales y medias sésiles, superiores adnatas; raquis castaño claro cubierto por escamas fimbriadas; costa con escamas de base fimbriada; venas 1- a 2-furcadas. Frondes fértiles 74–100 × 15–20 cm; pecíolos 15–30 cm, marrón

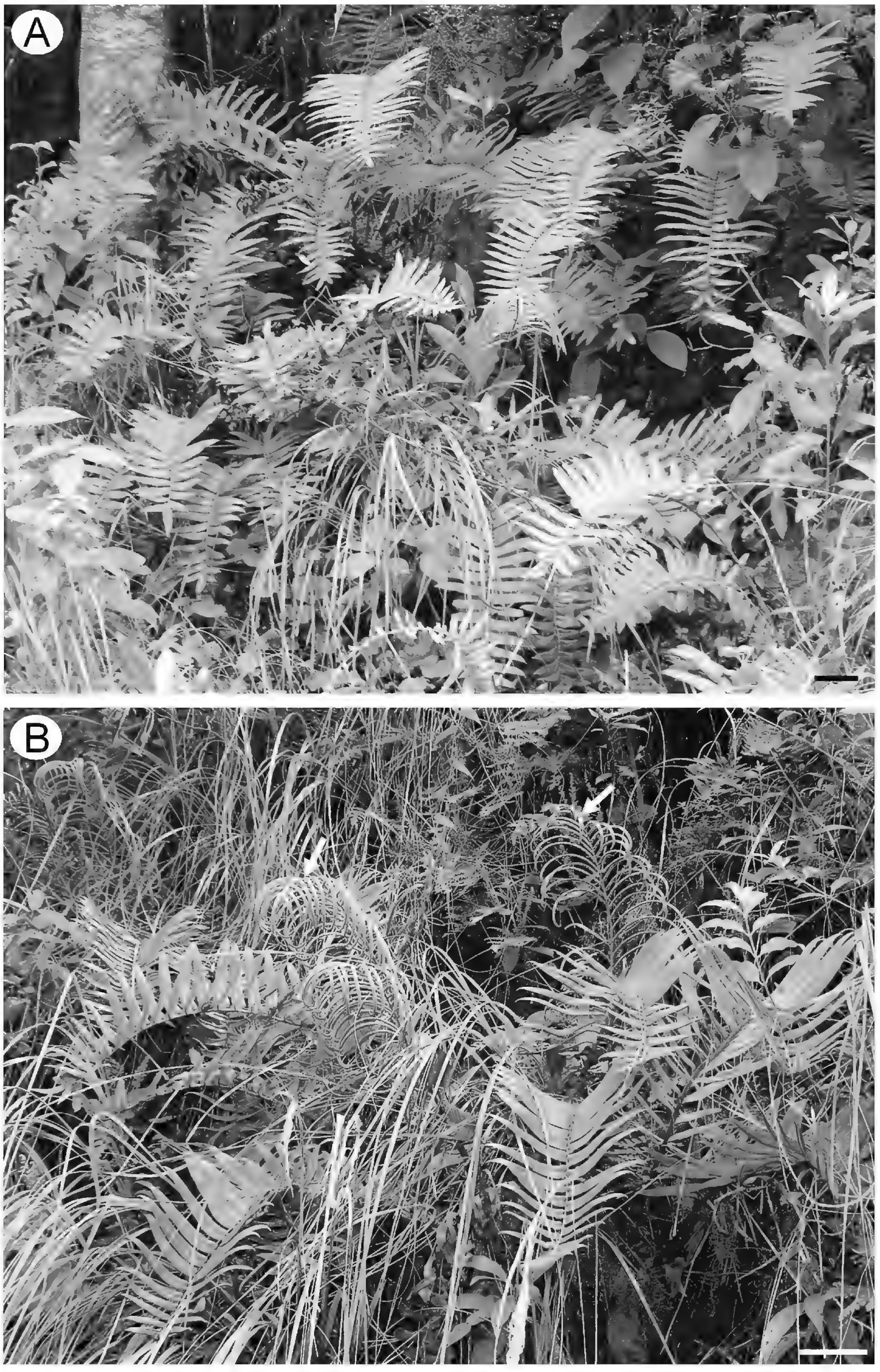

Figura 1. *Blechnum yungense* Ramos Giacosa. —A. Población de *B. yungense* en la localidad tipo. —B. Plantas adultas con algunas frondes fértiles (flechas). Escalas: A, B = 10 cm.

claros, surcados adaxialmente con escamas similares a las del rizoma; láminas 50–70 cm, elípticas a lanceoladas, 1-pinnadas, abruptamente reducidas hacia la base; pinnas 10–12 × ca. 0.4 cm, 19 a 35 pares, lineares; raquis castaño claro, cubierto por escamas fimbriadas; cenosoros marginales; indusios lacerado-fimbriados, castaños. Esporas monoletes, diámetro ecuatorial 82–95 µm, diámetro polar 61–79 µm, perisporio plegado con pliegues robustos en forma de lomo y ápice romo.

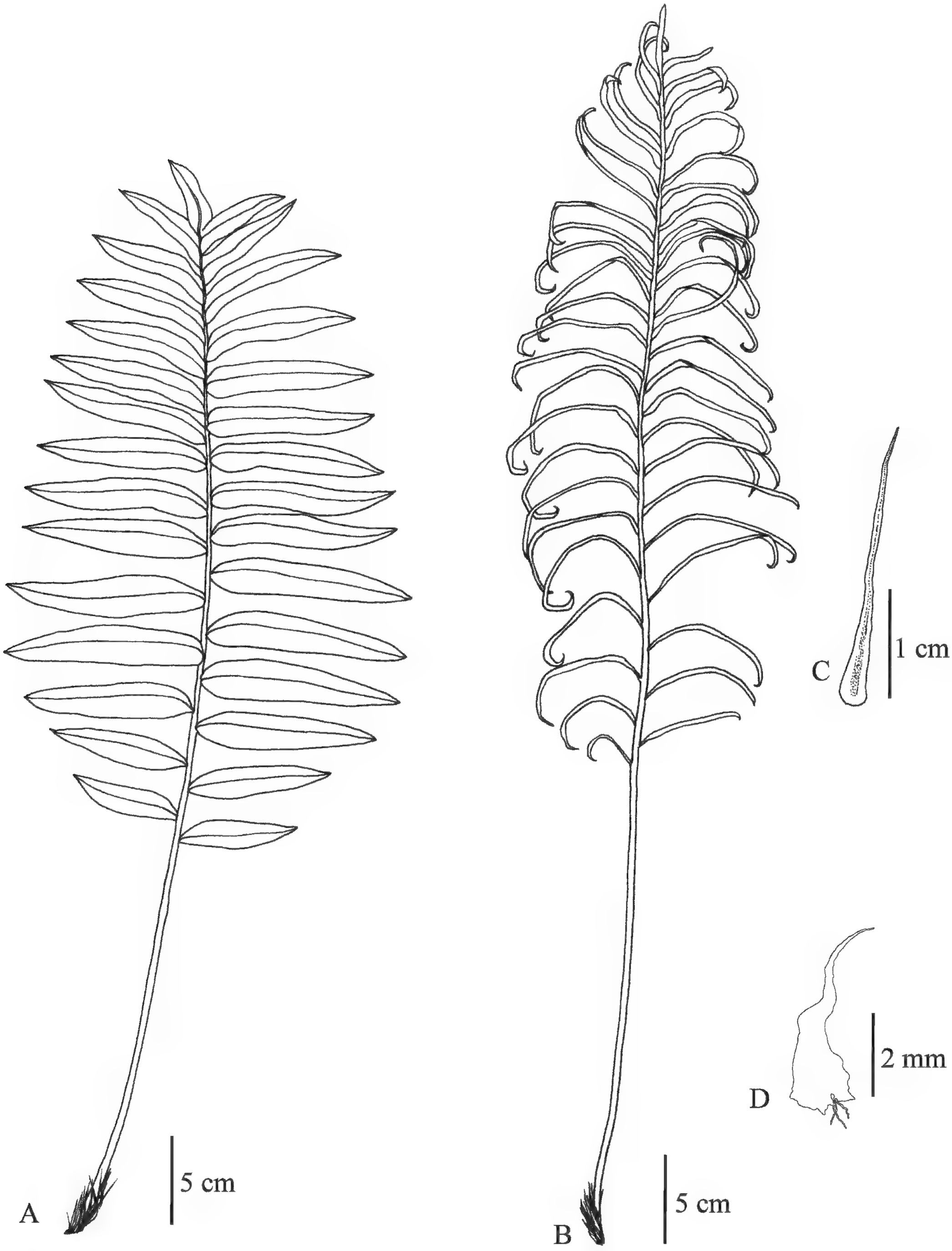

Figura 2. *Blechnum yungense* Ramos Giacosa. —A. Fronde estéril. —B. Fronde fértil. —C. Escama rizomática con parte central pluriestratificada. —D. Escama con base fimbriada de la fronde fértil. Del holotipo *Legname & Cuezzo 8609c* (LP).

Distribución geográfica, hábitat y categoría de la lista roja de IUCN. *Blechnum yungense* en Argentina se distribuye en las Provincias de Jujuy y Salta. En Bolivia crece en los Departamentos de Tarija y Santa Cruz. Esta nueva especie se desarrolla en selvas húmedas, con especies de los géneros *Cedrela* P. Browne, *Podocarpus* L'Hér. ex Pers. y *Juglans* L., también crece en pastizales. En Argentina se la puede

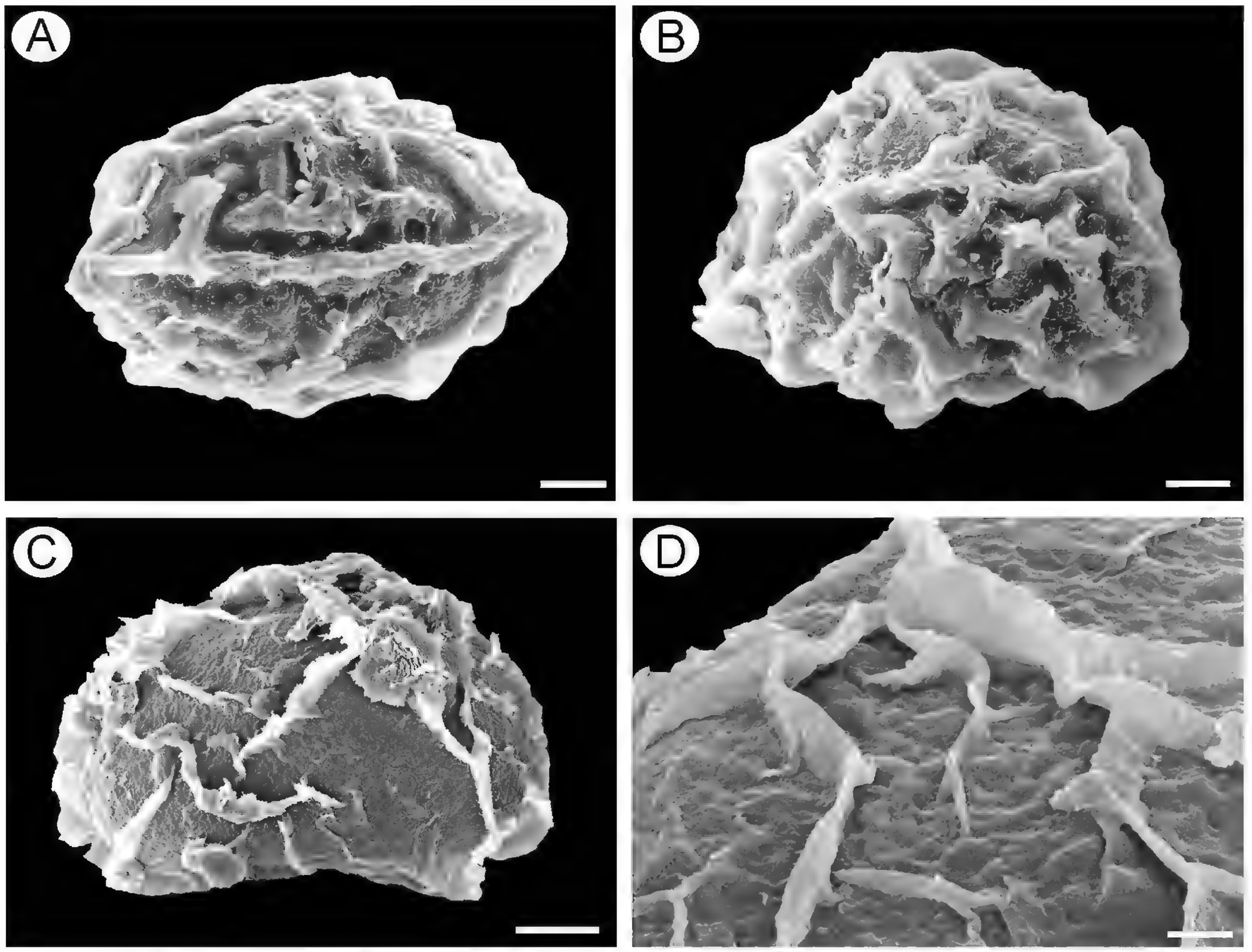

Figura 3. A, B. *Blechnum yungense* Ramos Giacosa. —A. Vista proximal de espora con contorno elíptico. —B. Vista ecuatorial de espora con perisporio plegado, con pliegues con forma de lomo. Del holotipo *Legname & Cuezzo 8609c* (LP). C, D. *Blechnum schomburgkii* (Klotzch) C. Chr. —C. Vista ecuatorial de espora con perisporio plegado. —D. Detalle del perisporio. Los pliegues poseen forma de cresta. De *L. Smith 1942* (GH). Escalas: A–C = 10 µm, D = 2 µm.

hallar entre los 1600–1700 m. En Bolivia se encuentra a altitudes por encima de los 2000 m. Debido a que se carece de la información necesaria sobre el estado de conservación de las poblaciones en todo el área de distribución, es conveniente ubicar a esta nueva especie dentro de la categoría datos insuficientes (DD) de la lista roja de la IUCN (IUCN, 2001).

La especie morfológicamente más similar a *Blechnum yungense* es probablemente *B. schomburgkii* (= *B. imperiale* (Fée & Glaz.) Christ in Schwacke). Esta especie es mencionada para Costa Rica, Panamá, Colombia, Venezuela, Guyanas, Perú, Bolivia y Brasil (Dittrich, 2005). *Blechnum yungense* puede distinguirse de *B. schomburgkii* por la lámina abruptamente reducida hacia la base, el tamaño de las pinnas estériles y la ornamentación de las esporas (Tabla 1).

Paratipos. ARGENTINA. **Jujuy:** Dpto. Ledesma, 11 nov. 2002, 1650 m, *F. O. Zuloaga 7508* (SI); Abra de las Cañas, 17 mar. 1966, *E. R. de la Sota 4439* (LP); Camino a Valle Grande, Abra de las Cañas, 1700 m, 18 oct. 1964, *A. L. Cabrera & H. Fabris 16108* (LP); Dpto. Valle Grande, 2 km de Abra de las Cañas, Camino a Valle Grande, 1670 m, 9 abr. 1971, *P. R. Legname & A. R. Cuezzo 8219c* (LIL, LP). **Salta:** Dpto. Santa Victoria, San José, 1800 m, 3 jul. 1998, *O. G. Martínez, M. A. Ganem & E. R. de la Sota 603* (LP); Baritú, 13 jul. 1999, *M. A. Ganem, O. G. Martínez & de la Sota 140* (LP); Camino Los Toldos a Lipeo, desvío a San José, 13 nov. 1997, *L. A. Cassá 286* (LP). BOLIVIA. **Santa Cruz:** Samaipata, ruinas incaicas, El Fuerte, 14 Aug. 1928, 2000 m,

Tabla 1. Cuadro comparativo de caracteres entre *Blechnum yungense* y *B. schomburgkii*.

	B. yungense	*B. schomburgkii*
Láminas	abruptamente reducidas hacia la base	gradualmente reducidas hacia la base
Pinnas estériles	8–12 × 1.6–2.4 cm	6–17 × 0.8–1.5 cm
Ornamentación de las esporas	pliegues robustos, con forma de lomo y ápice romo	pliegues delgados, con forma de cresta y ápice agudo

J. Steinbach 8259 (GH). **Tarija:** Tarija, 2400 m, apr. 1904, *K. Fiebrig 2256* (GH).

Material adicional estudiado de Blechnum schomburgkii. ARGENTINA. **Misiones:** Dpto. Cainguás, *E. Schwindt 4421* (LIL). BRAZIL. **Goiás:** Serra dos Cristais, *R. Anderson 8148* (LP); Chapada dos Veadeiros, *R. Anderson 6403* (LP). **Paraná:** 13 km de Horizonte, *A. Krapovickas & C. L. Cristóbal 39690* (LP). **Rio Grande do Sul:** São Leopoldo, *J. Dutra 278* (SI). **São Paulo:** Est. Biol. Alto da Serra, *L. Smith 1942* (GH). PARAGUAY. **Misiones:** Santiago, *T. M. Pedersen 4404* (SI). PERÚ. **Cuzco:** Prov. La Convención, *T. Dudley 10975* (GH). URUGUAY. **Canelones:** Balneario Santa Ana, *M. Bonifacino & R. Beyhaut 28850* (MVFA). **Rocha:** Parque Fortaleza Santa Teresa, *Rosengurtt 10816* (MVFA). **San José:** Barra de Santa Lucía, *M. B. Berro 2376* (MVFA). **Tacuarembó:** Sierra del Tacuarembó chico, *W. Herter 3525* (GH).

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New Species of *Eleocharis* subgen. *Limnochloa* (Cyperaceae) from the Old and New World Tropics

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Abstract. Two new tropical species in *Eleocharis* subgen. *Limnochloa* (P. Beauv. ex T. Lestib.) Torr. (Cyperaceae) are described and their relationships with presumably allied species are discussed. *Eleocharis hooperiana* D. J. Rosen from Sierra Leone in West Tropical Africa differs from the morphologically similar and presumably close taxonomic ally *E. nupeensis* Hutch. in a combination of coarser culms, longer and more coarsely spinulose perianth bristles, and larger fruits. *Eleocharis tenuiculmis* D. J. Rosen from the Brazilian state of Mato Grosso differs from the similar slender-culmed species *E. elongata* Chapm. in a combination of narrower culms, longer perianth bristles, and generally larger, biconvex fruits.

Resumen. Se describen dos nuevas especies tropicales de *Eleocharis* subgen. *Limnochloa* (P. Beauv. ex T. Lestib.) Torr. (Cyperaceae) y se discuten sus relaciones con especies presumiblemente relacionadas. *Eleocharis hooperiana* D. J. Rosen, de Sierra Leona en Africa tropical occidental, difiere de *E. nupeensis* Hutch., una especie morfológicamente similar y presumiblemente cercanamente relacionada, en tener tallos más robustos, cerdas del perianto más largas y más espinulosas, y frutos más grandes. *Eleocharis tenuiculmis* D. J. Rosen, del Estado Brasileño de Mato Grosso, difiere de *E. elongata* Chapm., otra especie de tallos delgados, en una combinación de tallos más delgados, cerdas del perianto más largas, y frutos biconvexos generalmente más grandes.

Key words: Brazil, Cyperaceae, *Eleocharis*, IUCN Red List, Mato Grosso, Sierra Leone, subgenus *Limnochloa*, West Tropical Africa.

Eleocharis R. Br. (Cyperaceae) is a cosmopolitan genus of over 200 species with a center of diversity in the Neotropics (González-Elizondo & Tena-Flores, 2000). *Eleocharis* subgen. *Limnochloa* (P. Beauv. ex T. Lestib.) Torr. is distinguished from other *Eleocharis* by a combination of cartilaginous, obscurely keeled, many-veined floral scales; often large culms that are usually as thick as the cylindrical spikelet; and biconvex (rarely trigonous) achenes usually sculptured with large, polygonal cells (González-Elizondo & Peterson, 1997). A recent resurgence of systematic study in subgenus *Limnochloa* has resulted in the description of several new species, particularly from the New World Tropics (González-Elizondo & Reznicek, 1996; Roalson, 1999; Trevisan & Boldrini, 2006; Rosen et al., 2007; Rosen & Hatch, 2007).

During a systematic study of select species complexes in *Eleocharis* subgen. *Limnochloa* (Rosen, 2006; Rosen et al., 2007), I examined herbarium specimens from West Tropical Africa that were variously annotated as *E. fistulosa* (Poir.) Link (an illegitimate name for *E. acutangula* (Roxb.) Schult.), *E. nupeensis* Hutch., and *E. variegata* (Poir.) C. Presl. After comparing these specimens to authentic specimens and types of the aforementioned taxa, it is my opinion that they represent an undescribed species.

1. Eleocharis hooperiana D. J. Rosen, sp. nov. TYPE: Sierra Leone. [Northern Prov.: Kambia Dist.], near Kuputu (Bramaia), in a stream, 20 Sep. 1949, *H. D. Jordan 342* (holotype, K). Figure 1A, B.

Haec species *Eleochariti nupeensi* Hutch. affinis, sed culmis longioribus et latioribus, squamis floralibus supernis longioribus, setis hypogynis grosse retrorso-spinulosis fere usque ad basim achenium superantibus, acheniis majoribus atque stylopodio pro ratione longiore differt.

Plants perennial; *roots* fine, fibrous, dark brown; rhizomes elongated, slender, reddish brown, to 1.5 mm thick, scales to 8.5 mm; *culms* terete, (40.5–)49–80(–83) cm × (1.3–)1.4–2.5(–2.8) mm, internally spongy, with incomplete transverse septa, brownish green. *Leaves* 2, reduced to sheaths, membranous, loose, friable, pinkish green to cinnamon basally, brownish to stramineous distally, apex of upper sheath acute. *Spikelets* cylindric, obtuse, (16–)17.7–23(–25) × (2–)2.2–3.1(–3) mm; proximal scale amplexicaulous and appearing as continuation of culm, remaining floral scales appressed to somewhat loose, ovate, central area rounded from base to near the apex, 4–4.4(–4.5) × 2.5–2.7(–2.8) mm, cartilaginous, abaxially stramineous, somewhat darkened centrally,

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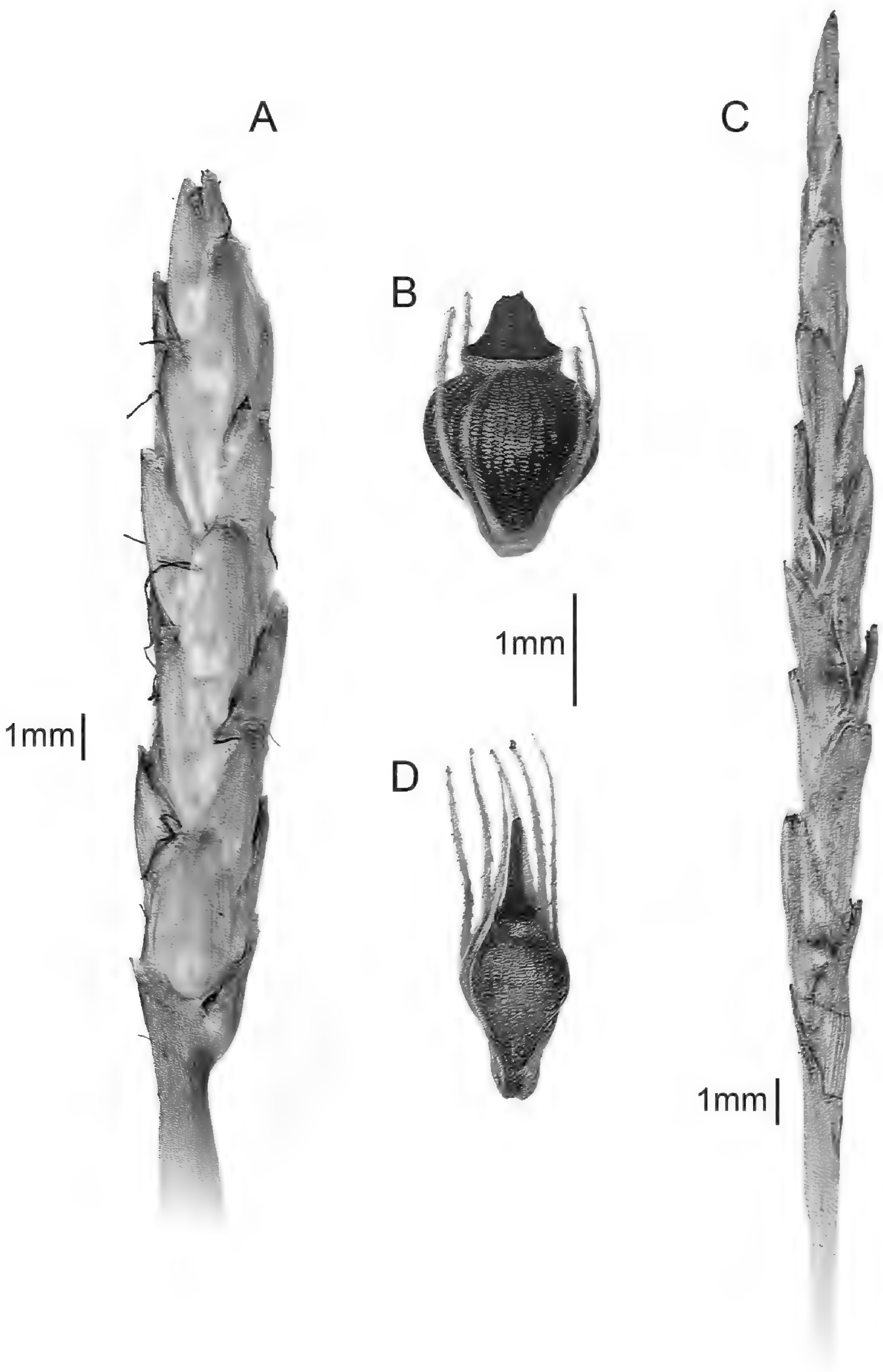

Figure 1. A, B. *Eleocharis hooperiana* D. J. Rosen. —A. Spikelet. —B. Achene. C, D. *Eleocharis tenuiculmis* D. J. Rosen. —C. Spikelet. —D. Achene. A, B from the holotype, *H. D. Jordan 342* (K); C, D from the holotype, *B. Maguire, J. M. Pires, C. K. Maguire & N. Silva 56412* (UB).

adaxially stramineous and faintly red-maculate, apex rounded, distal 0.2–0.4 mm translucent hyaline-erose, abaxially coarsely many-veined, adaxially only mid-vein conspicuous. *Flowers* with 6 or 7 perianth bristles; bristles subequal, usually all overtopping the achene (rarely 1 or 2 just reaching achene summit or slightly shorter), each coarsely retrorsely spinulose nearly to base, stramineous, sometimes streaked with

dark maroon near the tip; stamens 3; anthers (1.4–) 1.6–2.2(–2.4) mm, stramineous; style 2-fid. *Achenes* biconvex, widely obovoid, the shoulders rounded, 1.7–1.8(–2) × (1.3–)1.4–1.6(–1.7) mm, each face with (13)14 to 17 longitudinal rows of deeply concave, transversely oblong cells, pale yellowish, maturing to shiny dark amber or dark grayish brown, apex weakly constricted to about half the width of achene; *stylopodium* dorsoventrally compressed, deltate, with swollen thickening at base, distinctly separated from achene, in some specimens the apex retuse, (0.5–) 0.6–1(–1.1) × 0.8–0.9 mm, 0.6–1.3× longer than wide, stramineous, red-maculate, maturing to dark brown.

Habitat and distribution. Like other species in *Eleocharis* subgen. *Limnochloa*, *E. hooperiana* undoubtedly grows in wetland and aquatic habitats. Collection data for the type specimens provide very little information about the habitat of *E. hooperiana*. Aquatic habitats in the Fouta Djallon of Guinea and lower elevations in Sierra Leone include ponds, seasonal streams, and rivers of highland grasslands and gallery forests (Stefan Porembski, pers. comm.). *Eleocharis hooperiana* is currently known only from the type collections and is presumably endemic to Guinea and Sierra Leone, unlike the more widely distributed *E. nupeensis* from Senegal, Sierra Leone, Ghana, Ivory Coast, Nigeria, and Tanzania (Hooper, 1972; Lowe & Stanfield, 1974; Haines & Lye, 1983). One collection of the new taxon is from Friguiagbé in the Fouta Djallon, a rugged mountainous area in the southeast of Guinea, known to be a center of plant endemism (Beentje et al., 1994).

IUCN Red List category. Too little is known about *Eleocharis hooperiana* to accurately evaluate its conservation status. For now, it seems sufficient to assign a conservation status as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Etymology. The specific epithet of the new taxon is dedicated to Sheila S. Hooper (b. 1925), formerly a taxonomist at the Royal Botanic Gardens, Kew, until her retirement in 1985. Her research focuses on the systematics of Cyperaceae with special emphasis on tropical Africa and India.

Relationships. Eleocharis hooperiana appears to be closely related to *E. nupeensis*, differing in possessing generally longer and wider culms, longer floral scales, longer and more coarsely spinulose perianth bristles, slightly larger achenes, and a longer stylopodium.

Taxonomy and affinities. Hooper (1972) treated six species belonging to *Eleocharis* subgen. *Limnochloa* in West Tropical Africa: *E. dulcis* (Burm. f.) Trin. ex Hensch., *E. decoriglumis* Berhaut, *E. acutangula*, *E. mutata* (L.) Roem. & Schult., *E. variegata*, and *E. nupeensis*. She considered *E. nupeensis* to be a species of questionable validity in need of further study, because of its unknown relationship with the Latin American *E. tiarata* Gómez-Laur. (as *E. mitrata* Franch. & Sav. ex Makino), *E. variegata*, and *E. acutangula*. Svenson (1939) also suggested that the distinctions among *E. nupeensis*, *E. acutangula* (as *E. fistulosa*), *E. mutata*, *E. variegata*, and *E. calocarpa* Cherm. are not well defined. *Eleocharis nupeensis* and *E. hooperiana* differ markedly from these species in characteristics of the floral scales, the nature of the constriction between the achene and style base (stylopodium), the shape of the achene epidermal cells, and degree of achene surface sculpturing. *Eleocharis nupeensis* and *E. hooperiana* differ from *E. mitrata* in having longer and wider floral scales that are less densely packed and lack a trilobed stylopodium base characteristic of the Latin American species. The following artificial key separates *E. hooperiana* from species with which the taxon has been confused in West Tropical Africa.

ARTIFICIAL KEY TO *ELEOCHARIS HOOPERIANA*

1a. Culms triquetrous (sharply 3-angled); achene apex markedly constricted to a short neck . . . . *E. acutangula*
1b. Culms trigonous (bluntly 3-angled) to terete; achene apex weakly constricted to sub-annulate.
  2a. Floral scales with conspicuous translucent apical hyaline-erose region > 0.7 mm wide; styles 3-fid (rarely some 2-fid); achene epidermal cells transversely widely oblong, inflated, the achene surface appearing smooth; stylopodium arising from central sunken region of truncate to sub-annular summit of achene. . . . . *E. variegata*
  2b. Floral scales with apical hyaline-erose region 0.2–0.4 mm wide; styles 2-fid; achene epidermal cells narrowly transversely oblong, concave, the surface with conspicuous longitudinal ridges; stylopodium with swollen thickening at base but distinctly separated from achene by a weak constriction and not arising from central sunken region of truncate to sub-annular summit of achene.
    3a. Culms (40.5–)49–80(–83) cm × (1.3–) 1.4–2.5(–2.8) mm; floral scales 4–4.4 (–4.5) mm long; perianth bristles subequal, usually all overtopping the achene (rarely 1 or 2 just reaching its summit or slightly shorter), coarsely, retrorsely spinulose nearly to base; achene 1.7–1.8(–2) × (1.3–)1.4–1.6 (–1.7) mm; stylopodium 0.6–1.3× longer than wide . . . . . *E. hooperiana*
    3b. Culms 30–50 cm × 0.5–1 mm; floral scales 3.5–4 mm long; perianth bristles markedly unequal, usually all less than half the length of the achene or shorter

(some rudimentary), smooth or with a few retrorse spinules near the tips; achene ca. 1.6 × to 1.2 mm; stylopodium 0.3–0.5× longer than wide. . . . . *E. nupeensis*

Paratypes. REPUBLIC OF GUINEA. [**Kindia:**] Friguiagbé, 6 Apr. 1938, *J. Chillou 697* (C). SIERRA LEONE. [**Northern Prov.:**] near Kambia, in water in rocky pool in stream, 3 Sep. 1949, *H. D. Jordan 306* (K [2]).

My study of *Eleocharis* specimens at Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional (CIIDIR) during 2005 and 2007 led to the discovery of a specimen that had been previously annotated as *Eleocharis* aff. *brasiliensis* Boeckeler by Socorro González-Elizondo with a few notes about the differences from that species, indicating that she recognized that it probably represented a new species. This specimen and four duplicates retained at NY are the basis for the remarkably distinct new slender-culmed species described below.

2. Eleocharis tenuiculmis D. J. Rosen, sp. nov. TYPE: Brazil [Centro-Oeste region]. Mato Grosso: submerged in running water, 50 km W of Diamantino, watershed 700–900 m alt., Brasilia–Acre Hwy., 30 Aug. 1963, *B. Maguire, J. M. Pires, C. K. Maguire & N. Silva 56412* (holotype, UB; isotypes, CIIDIR, MO, NY, TAES). Figure 1C, D.

Haec species *Eleochariti elongata* Chapm. similis, sed ab ea culmis angustioribus, squamis floralibus supernis laxius imbricatis, setis hypogynis longioribus, acheniis biconvexis plerumque majoribus atque stylopodio majoribus differt.

Plants slender perennials; *roots* fine, fibrous, dark brown; rhizomes elongated, slender, dark reddish brown, to 1.2 mm thick, scales loose, friable; *culms* terete, 28–38 cm × 0.5–0.7 mm, internally spongy, with incomplete transverse septa, light green to brownish green. *Leaves* 2, reduced to sheaths, membranous, reddish green to cinnamon basally, brownish to stramineous distally, apex of upper sheath acute. *Spikelets* cylindric, about as wide as one floral scale, (18–)20–27(–29) × 0.8–1.9(–2) mm; proximal scale with a flower, amplexicaulous, somewhat loose and the tip sometimes slightly divergent, remaining floral scales appressed to somewhat loose, weakly imbricate, elliptic, central area rounded from base to near the apex, 3.7–4.3(–4.6) × (1–)1.4–1.9(–2) mm, cartilaginous, abaxially greenish, marginally and adaxially stramineous and sparsely red-maculate, apex rounded, distal ca. 0.2 mm translucent hyaline-erose, abaxially finely many-veined, adaxially only midvein conspicuous. *Flowers* with (5)6 perianth bristles, the longest 3–4 mm, subequal, usually all overtopping the stylopodium, as much as 1.7× longer than fruit, each coarsely retrorsely spinulose nearly to base, stramineous; stamens 3; anthers to 1.3 mm, stramineous; style 2-fid. *Achenes* biconvex, obovoid to pyriform, the shoulders rounded, the margins costate or nearly so, 1.4–1.7(–1.9) × ca. 1 mm, each face with 13 to 15 longitudinal rows of deeply concave, transversely oblong cells, shiny, greenish, maturing to light brown, apex conspicuously constricted to ca. 0.4× the width of achene; *stylopodium* dorsoventrally compressed, narrowly triangular, distinctly separated from achene, 0.7–1 × 0.3–0.5(–0.6) mm, dark brown.

Habitat and distribution. Like other species in *Eleocharis* subgen. *Limnochloa*, *E. tenuiculmis* undoubtedly grows in wetland and aquatic habitats. Collection data for the type specimen indicate only that it was collected from running water.

IUCN Red List category. Too little is known about *Eleocharis tenuiculmis* to accurately evaluate its conservation status. For now, it seems sufficient to assign a conservation status as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Etymology. The specific epithet indicates the remarkably slender culms of the species.

Relationships. Eleocharis tenuiculmis is morphologically very similar to *E. elongata* Chapm. in possessing very slender culms, but differs in having spikelets with floral scales that are less markedly overlapping, longer perianth bristles, and generally larger, biconvex fruits.

The following artificial key modified from Svenson (1939) will help separate *Eleocharis tenuiculmis* from *E. elongata* and other slender-culmed species of *Eleocharis* subgen. *Limnochloa* in South America with which it might be confused.

ARTIFICIAL KEY TO *ELEOCHARIS TENUICULMIS*

1a. Achenes compressed trigonous (the abaxial angle sometimes costate) or rarely biconvex, 0.65–1.4 mm long, floral scales usually with a conspicuous dark brownish black submarginal band. . . . . *E. elongata*

1b. Achenes biconvex, usually 1.4 mm long or longer, floral scales without or with a faint submarginal darkened band.

2a. Culms terete; floral scales abaxially many-veined, the veins slightly to conspicuously raised and visible at 20×; achene constricted below the stylopodium, sometimes weakly so in *E. tenuiculmis* and *E. tiarata*.

3a. Perianth bristles usually all less than half the length of the achene or shorter, smooth; style base trilobed. . . . . *E. tiarata*

3b. Perianth bristles longer than achene, coarsely retrorsely spinulose; style base not trilobed.

4a. Culms 0.5–0.7 mm wide; perianth bristles as much as 1.7× longer than fruit; achenes greenish to light brown, each face with 13 to 15 longitudinal rows of epidermal cells. . . . . *E. tenuiculmis*

4b. Culms 0.5–2.1 mm wide; perianth bristles about as long as fruit, seldom any overtopping the stylopodium; achenes maturing to dull blackish brown, each face with about 12 rows of epidermal cells. . . . . *E. jelskiana* Boeckeler

2b. Culms trigonous; floral scales abaxially cellular-lineate, raised veins not evident at 20×; except for the centermost, achene not constricted below the stylopodium . . . . . *E. plicarhachis* (Griseb.) Svenson

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Una Nueva Especie de *Miconia* (Melastomataceae) de la Sierra Mazateca, Oaxaca, México

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RESUMEN. Se describe e ilustra *Miconia mazatecana* de Santiago, una nueva especie de Melastomataceae posiblemente dioica de la Sierra Mazateca de Oaxaca, México. Pertenece a un grupo de especies de la sección *Amblyarrhena* (Naudin) Triana centrado en los Andes, que presenta filamentos y estilos con pelos glandulares. Se relaciona lejanamente con *M. tacanensis* Wurdack del Volcán Tacaná en los límites entre México y Guatemala, debido a la pubescencia escamosa-dendrítica de ramas, hojas e inflorescencia y por la pubescencia glandular en filamentos y estilos. *Miconia cajanumana* Wurdack del Ecuador, se le asemeja por sus ramas y pecíolos con pelos patentes y hojas con acarodomacios de pelos. Se discute también su morfología floral en comparación con la de especies dioicas de *Miconia* Ruiz & Pav. sección *Cremanium* Triana.

ABSTRACT. *Miconia mazatecana* de Santiago, a possibly dioecious new species of Melastomataceae from the Sierra Mazateca, Oaxaca, is described and illustrated. This species belongs to a species group of section *Amblyarrhena* (Naudin) Triana centered in the Andes with glandular filaments and styles; it is distantly related to *M. tacanensis* Wurdack from Volcán Tacaná on the Mexican–Guatemalan border based on its squamulous to dendritic pubescence on the branches, leaves, and inflorescence and the glandular pubescence of filaments and styles. It resembles *M. cajanumana* Wurdack of Ecuador in its branches and petioles with patent hairs and leaves bearing acarodomatia. Its floral morphology is also discussed in comparison with dioecious species of *Miconia* Ruiz & Pav. sect. *Cremanium* Triana.

Key words: IUCN Red List, Melastomataceae, Mexico, *Miconia*, Oaxaca, sect. *Amblyarrhena*.

Miconia Ruiz & Pav. es un género ampliamente distribuido en América tropical, principalmente en la cuenca del Amazonas y regiones andinas adyacentes, y ocupa una posición central dentro del complejo de géneros que constituyen la taxonomicamente difícil tribu Miconieae (Almeda, 1984). El género muestra gran diversidad en los tricomas (Wurdack, 1986) y en la forma de las anteras y de las semillas. Las secciones tradicionalmente reconocidas en este género han sido caracterizadas por diferencias en varios caracteres de las anteras junto con la forma del hipantio-cáliz (Judd & Skean, 1991).

Miconia, uno de los géneros más grandes de plantas vasculares con alrededor de 1050 especies (Goldenberg et al., 2008), presenta una diversidad notable en México con cerca de 90 especies, de las cuales alrededor de una cuarta parte son endémicas, principalmente de las regiones montañosas del país. Algunas de estas endémicas no tienen especies cercanas en México o en América Central, como son los casos de *M. militis* Wurdack, *M. obconica* Gleason & Wurdack y *M. tacanensis* Wurdack, cuyos taxones relacionados se encuentran en las regiones andinas de América del Sur (Wurdack, 1967, 1968).

Para separar especies dentro de *Miconia* se han utilizado una serie de atributos tomados en conjunto como son el tamaño y forma de las hojas, la sección transversal de las ramas (Renner & Beck, 2003), la presencia de distintas combinaciones de tricomas (Wurdack, 1986), el tamaño y forma de otras estructuras florales, y en algunos casos estructuras como los mirmecodomacios o los acarodomacios entre otros.

Wurdack (1973: 469) menciona una serie de especies con anteras oblongas de poro terminal pequeño, típicas de *Miconia* sección *Amblyarrhena* (Naudin) Triana, flores relativamente grandes y filamentos de los estambres y estilo con pelos de ápice glandular y las incluye informalmente en lo que él llama "complejo de especies con flores grandes de la sección *Amblyarrhena*". Este grupo, considerando esos atributos, consiste en unas 40–50 especies, más de 30 de ellas en Ecuador (Wurdack, 1967, 1968, 1980), y está representado en Mesoamérica por *M. goniostigma* Triana (Ecuador, Colombia y Panamá), *M. loreyoides* Triana (Ecuador, Colombia, Panamá y Costa Rica) y *M. tacanensis* (Guatemala y Chiapas, México).

Algunas colectas de una especie desconocida de *Miconia* sección *Amblyarrhena* coinciden con las

especies anteriores en la presencia de flores con filamentos y estilo con pelos glandulares y estigma capitado, procedentes de la Sierra Mazateca en el norte de Oaxaca, pero difieren en que tienen dos morfos florales en individuos distintos, uno con estilo corto y estigma escasamente expandido y el otro con estilo largo y estigma capitado, se propone aquí como un taxón nuevo para la ciencia.

Miconia mazatecana de Santiago, sp. nov. TIPO: México. Oaxaca: Mpio. Santa María Chilchotla, 0.7 km NE de Agua de Gancho, flores con estilo largo, 1620 m, 18°11′52″, 96°49′34.6″, 22 mar. 2008, *R. de Santiago 2076* (holotipo, MEXU; isotipos, CAS, ENCB, FCME, IEB, MO, OAX, US, XAL). Figura 1.

Haec species *Miconiae tacanensi* Wurdack distanter affinis, sed ab ea ramis obtuse tetragonis, ramis petiolis atque laminis foliaribus subtus ad axillas nervorum primariorum trichomatibus elongatis delicate barbellatis, foliis plerumque longi-acuminatis 3- (vel 5)-plinervis, hypanthio intus et ovario per costulas trichomatibus glandularibus puberulis etiam petalis adaxialiter basim versus glandulari-puberulis differt.

Árboles de 2–5 m de alto; entrenudos obtusamente cuadrados, densa a moderadamente con tricomas dendrítico-escamosos café-dorados mezclados con glándulas sésiles rojizas diminutas y subdensa a esparcidamente con pelos patentes rectos a flexuosos y finamente barbulados, de 0.4–1.4 mm, ramas adultas obtusamente cuadradas y glabrescentes. Pecíolos canaliculados adaxialmente, de 1.5–4.8 cm, con pubescencia similar a la de los entrenudos jóvenes, los pelos patentes en ocasiones ausentes o limitados al ápice cerca de la base de la lámina; láminas elípticas a obovadas, 8.5–22.5 × 2.6–7.2 cm, con el ápice acuminado a comúnmente largo acuminado, el margen entero a tenuemente ondulado y la base obtusa a redondeada a aguda e inconspicuamente cordada con dos pequeños lóbulos observables adaxialmente sobre el pecíolo, cartáceas; 3- ó 5-plinervadas con el primer par de nervios primarios laterales separándose del central a 0.3–1 mm de la base y formando un domacio de cavidad, y el segundo par saliendo cerca de la base, cercano al margen y poco evidente, laxamente reticuladas con los nervios secundarios separados entre sí hacia la parte media de las hojas (2–)2.5–8 mm y los terciarios (1–)1.5–2 mm; superficie adaxial con glándulas sésiles rojizas, y dendrítico-escamosa en los nervios centrales hacia la base; superficie abaxial con glándulas rojizas esparcidas, nervios primarios y secundarios con glándulas sésiles rojizas y tricomas dendrítico-escamosos, los primarios mayormente hacia la base con pelos rectos o poco flexuosos diminuta e inconspicuamente barbulados similares a los de los entrenudos, hacia la base entre el nervio central y el primer par de nervios laterales formando un domacio con los pelos algo flexuosos. Inflorescencia un tirso pedunculado o sésil, si pedunculado algunas veces con una sola rama lateral en la base de 7.8–14 cm, con las ramas cuadradas aplanadas, con pelos dendrítico-escamosos y con o sin pelos patentes semejantes a los de los entrenudos, las ramitas terminando en grupos de 3(1) flores pediceladas, articuladas o no; bractéolas caducas, lanceoladas a oblanceoladas, 1.2–2 × 0.36–0.54 mm, dendrítico-escamosas abaxialmente; pedicelos 1.7–3.4 mm. Flores pentámeras o muy raramente tetrámeras, hexámeras o heptámeras, con estilo corto en plantas sin frutos observables y con estilo largo en plantas con frutos; hipantio urceolado, 3.2–3.6 mm de largo (hasta el tálamo), 3.1–3.7 mm de ancho, por fuera con glándulas sésiles rojizas y dendrítico-escamoso y por dentro densamente papiloso y esparcidamente pubérulo sobre costillas poco evidentes y cerca del margen del tálamo con pelos blanquecinos glandulares de 0.04–0.08 mm; cáliz de 0.3–0.6 mm de alto, lóbulos internos anchamente triangulares a redondeados a irregulares de 0.7–0.8 mm desde el tálamo, escamoso-dendríticos hacia el ápice por fuera, dientes externos ampliamente triangulares y tuberculados, igualando a los lóbulos internos; pétalos 4 ó 5(6 ó 7), blancos, obovados a anchamente orbiculares con el ápice algunas veces redondeado pero generalmente emarginado con uno de los lóbulos más largo y algo plegado, los de las flores con estilos cortos 2.4–2.7 × 2.4–2.7 mm, y los de las flores con estilos largos 3–3.4 × 3–3.3 mm, densamente granulosos en ambas superficies con unos pocos pelos glandulares adaxialmente cerca de la base de 0.1–0.2 mm; estambres 8 ó 10(12 ó 14), subisomórficos, los antisépalos con un lóbulo espatulado dorsalmente en la base del conectivo y el poro inclinado ventralmente, los antipétalos con un lóbulo agudo triangular dorsalmente en la base del conectivo y el poro terminal; filamentos de 2.5–3.8 mm, pubérulos con pelos glandulares de 0.1–0.16(–0.2) mm, tecas oblongas ligera a moderadamente curvadas introrsamente con el ápice agudo en vista lateral, de (2.5–)2.8–3.2 mm, poro de 0.14–0.16 mm diám. en los estambres antipétalos o de 2–2.4 mm en los antisépalos; ovario 3- (ó 4)-locular, 8 ó 10- (12 ó 14)-costado, 1/2 ínfero en las flores con estilo corto, 1/4–1/3 ínfero en las flores con estilo largo, pubérulo en el ápice, en el interior de la depresión estilar y en las costillas con pelos glandulares de 0.05–0.1 mm; estilo inmerso en el ovario ca. 0.7 mm con pelos glandulares de 0.1–0.2 mm, estilos cortos de 3–4 mm con el estigma levemente expandido de 0.6–0.7 mm

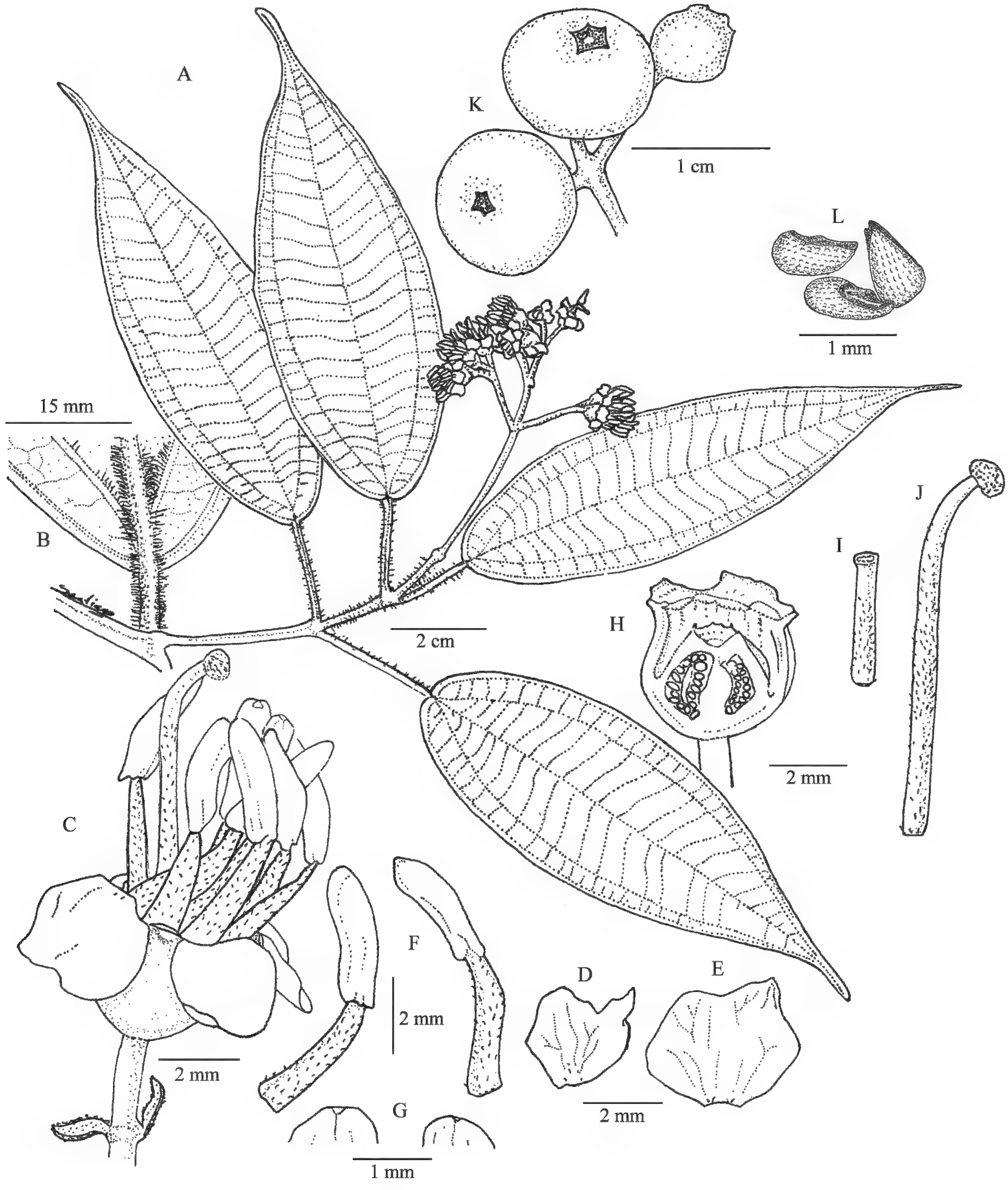

Figura 1. *Miconia mazatecana* de Santiago. —A. Rama con inflorescencia. —B. Base de la hoja mostrando la superficie abaxial. —C. Flor con el estilo largo. —D. Pétalo de flor con estilo corto. —E. Pétalo de flor con estilo largo. —F. Estambres antisépalo (izquierda) y antipétalo (derecha). —G. Ápice de las anteras visto por debajo de los estambres antisépalo (izquierda) y antipétalo (derecha). —H. Corte longitudinal de la flor; pétalos y estambres removidos. —I. Estilo corto. —J. Estilo largo. —K. Frutos. —L. Semillas. A y B basados en *R. de Santiago 2071* (FCME); C, E–H y J basados en *R. de Santiago 2078* (FCME); D e I basados en *R. de Santiago 2079* (FCME); K y L basados en *R. de Santiago 2360* (FCME).

diám., estilos largos ligeramente curvados de 8.2–9.7 mm con el estigma capitado de 0.9–1.2 mm diám. Fruto una baya azul claro, obloide, 9–11 × 8–9 mm diám.; semillas numerosas en cada lóculo, ovoides a triangulares, diminutamente tuberculadas, 0.8–1 × 0.5–0.6 mm.

Distribución y hábitat. Esta especie es conocida solamente de dos zonas de la Sierra Mazateca de Oaxaca, una en el municipio de Santa María Chilchotla al norte de Huautla de Jiménez en vegetación secundaria derivada de bosque mesófilo de montaña o de encinar sobre un sustrato de roca

Tabla 1. Comparación de caracteres diagnósticos de *Miconia tacanensis* y *M. mazatecana*.

	M. tacanensis	*M. mazatecana*
Tallos	agudamente cuadrados	obtusamente cuadrados
Pubescencia	escamosa, sin pelos extendidos	escamosa, con pelos extendidos en tallos, pecíolos y envés foliar
Domacios	ausentes	presentes, formados por pelos extendidos
Flores	pentámeras	comúnmente pentámeras, 4 ó 5(6 ó 7) meras
Hipantio por dentro	liso, glabro, no papiloso	con pelos glandulares diminutos sobre costillas poco evidentes, papiloso
Pétalos	sin pelos glandulares	con pelos glandulares diminutos, adaxialmente hacia la base
Ovario	glandular-pubérulo en el ápice	glandular-pubérulo en el ápice y en las costillas

caliza, entre 1450 y 1750 m de altitud y la segunda del municipio de San José Tenango en una zona con vegetación de bosque mesófilo de montaña con *Cupressus* L. a 1760 m.

Categoría de la lista roja de IUCN. La conservación para *Miconia mazatecana* debe ser considerada como casi amenazada (NT) de acuerdo con las categorías y criterios de la lista roja (IUCN, 2001), debido a que, a pesar de que no existen estudios poblacionales de esta especie y por lo tanto se desconoce su abundancia real, se le ha encontrado únicamente en tres sitios distintos de la Sierra Mazateca y las poblaciones, aunque poseen individuos vigorosos y aparentemente estables, son poco numerosas.

Fenología. *Miconia mazatecana* ha sido colectada con botones florales, flores en antesis y frutos inmaduros desde enero hasta julio y con frutos maduros desde mayo hasta julio, lo que indica una época de floración que se extiende probablemente desde noviembre o diciembre hasta más allá de julio y de fructificación desde mayo hasta agosto.

Etimología. Se nombra esta especie por la Sierra Mazateca de Oaxaca, única región donde se ha encontrado, en zonas poco accesibles y escasamente colectadas.

Discusión. *Miconia tacanensis*, el otro representante mexicano del grupo de especies de flores grandes de la sección *Amblyarrhena*, de acuerdo con lo observado en el isotipo *E. Matuda 2939* (MEXU) y una colecta adicional, también del Volcán Tacaná (*E. Martínez 19448*, MEXU), difiere principalmente en que tiene tallos agudamente cuadrados, carece de pelos extendidos en tallos y hojas, tiene flores exclusivamente pentámeras y presenta pelos glandulares exclusivamente en filamentos, estilos y ápice del ovario (Tabla 1).

Miconia mazatecana se asemeja morfológicamente a *M. cajanumana* Wurdack de la región andina de Ecuador: ambas especies tienen ramas, pecíolos y axilas de las venas primarias por el envés con pelos erectos cortos (simples en *M. cajanumana* de acuerdo con Wurdack, 1967, 1973) y pelos dendrítico-escamosos en ramas, hojas, inflorescencias e hipantio; sin embargo, *M. cajanumana* tiene hojas más pequeñas (de hasta 10 cm de largo) con el ápice agudo a cortamente acuminado, flores pentámeras o hexámeras, hipantio por dentro no costulado ni glandular-pubérulo, dientes del cáliz sobrepasando ampliamente a los lóbulos internos, pétalos glabros de 3.7–4.2 mm, estambres isomórficos con los poros de las anteras inclinados ventralmente, estilo de 8 mm de longitud y ovario 4-locular no costulado (Wurdack, 1967). La separación geográfica entre las dos especies no apoya una relación estrecha entre ambas, aunque se debe considerar que Wurdack propone a especies andinas como relativos cercanos de *M. militis* Wurdack y *M. obconica* (Wurdack, 1968), por ejemplo.

En México, se puede confundir *Miconia mazatecana* con *M. oligotricha* (DC.) Naudin, especie perteneciente a la sección *Cremanium* Triana, que tiene tricomas dendrítico-escamosos y glándulas sésiles diminutas en casi toda la planta, además de pelos rectos en ramas y pecíolos; sin embargo, las hojas de esta última especie tienen láminas cortamente acuminadas y evidentemente ciliadas (no ciliadas en *M. mazatecana*), mientras los pelos rectos se encuentran únicamente en ramas y pecíolos y son lisos, con la coloración general de la pubescencia tendiendo a ser grisácea (café-dorado a rojiza en *M. mazatecana*).

Además del grupo formado por *Miconia mazatecana* y *M. tacanensis*, *Miconia* sección *Amblyarrhena* esta representado en México principalmente por un grupo de especies casi endémico de México, que tienen mechones de pelos en las axilas de los nervios primarios de las hojas, anteras de una o de las dos series de estambres fuertemente arqueadas introrsamente, estilo glabro o escasamente glandular-pubérulo y estigma puntiforme; este grupo que se distribuye desde Sinaloa hasta Guatemala en zonas montañosas que drenan hacia el Océano Pacífico, incluye a *M.*

madrensis Standl. (Sinaloa a Guerrero), *M. tepicana* Standl. (Nayarit y Jalisco), *M. heterothrix* Gleason & Wurdack (Michoacán y Guerrero), *M. teotepecensis* de Santiago (Guerrero y Oaxaca), *M. glabrata* Cogn. (Guerrero, Oaxaca, Chiapas y Guatemala) y *M. phaeotricha* Naudin (Oaxaca). Las especies restantes y que no se encuentran claramente relacionadas entre sí son *M. costaricensis* Cogn. (con filamentos glandular-pubérulos, pero el estilo pubérulo sin pelos glandulares y el estigma truncado), *M. livida* Triana, *M. militis* y *M. moorei* Wurdack, las cuatro con las anteras de menos de 2 mm de largo y el estigma truncado a levemente expandido.

Diferentes visitas a la localidad típica de *Miconia mazatecana*, permitieron observar que existen dos tipos de individuos en esta especie: uno cuyas flores tienen estilo corto y recto, estigma ligeramente expandido y no producen frutos, y el otro en que las flores tienen estilo largo e inclinado hacia uno de los lados y estigma capitado, los individuos casi siempre con flores en botón, flores en antesis y frutos inmaduros simultáneamente. En los dos tipos de flor tanto las anteras como los ovarios tienen la apariencia de ser funcionales; sin embargo los granos de polen de las flores con estilo largo son inaperturados, mientras que el polen de las flores con estilo largo es tricolporado heterocolpado (Fig. 2), como la mayoría en Melastomataceae (Patel et al., 1984). Aunque hacen falta estudios que definan si los estilos cortos son funcionales o si de alguna otra forma las flores con ese tipo de estilo pueden producir frutos, lo que se conoce de esta especie permite proponer que es dioica, de forma similar a la de algunas especies de *Saurauia* Willd., *Actinidia* Lindl., *Decaspermum* J. R. Forst. & G. Forst. y *Solanum* L., en las que anteras de las flores pistiladas producen polen que sirve como forraje para atraer a los polinizadores y que se han caracterizado como dioicas o crípticamente dioicas (Crane, 1993).

Por otro lado, el síndrome mencionado es parecido al grupo de especies dioicas de la sección *Cremanium* que, de acuerdo con Almeda y Dorr (2006), presentan flores unisexuales que consistentemente tienen órganos vestigiales del otro sexo: las plantas masculinas con las anteras funcionales, el estilo muy corto y el ovario rudimentario, mientras las femeninas tienen las anteras no funcionales (generalmente colapsadas y sin polen), los estilos largos con el estigma capitado y el ovario funcional.

Paratipos. MEXICO. **Oaxaca:** Mpio. San José Tenango, San Martín Caballero, 2.8 km WSW, Nita Gatziquin, *C. Perret 242* (MEXU); Mpio. Santa María Chilchotla, 0.4 km al NE de Agua de Gancho, *R. de Santiago 2071*, *2072*, *2074*, *2075*, *2342*, *2343*, *2363* (FCME, MEXU); 0.7 km NE de Agua de Gancho, *R. de Santiago 2077*, *2078*, *2079*, *2340*, *2341*, *2360*, *2361*, *2362* (FCME, MEXU); alrededores de la brecha de Sta. María Chilchotla a Zongólica Chilchotla, *X. Munn-Estrada 944* (MEXU, XAL); NE de la comun. Agua de Gancho, Agencia Mpio. María Luisa, ladera con exposición, *X. Munn-Estrada 978*, con *E. Juárez* y *J. Juárez* (ENCB, FCME, MEXU).

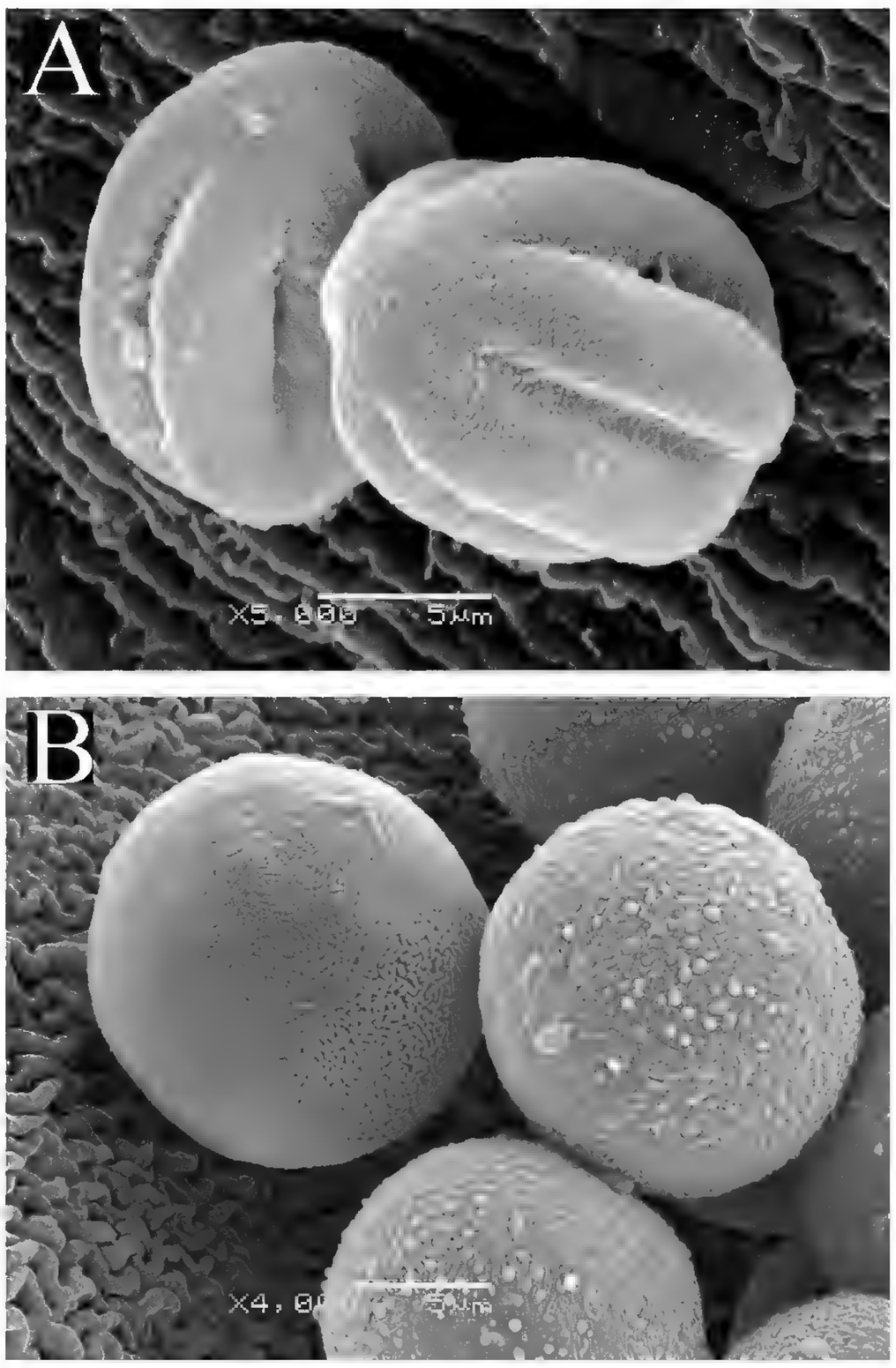

Figura 2. *Miconia mazatecana* de Santiago. —A. Granos de polen de flor con estilo corto. —B. Granos de polen de flor con estilo largo. A basada en *R. de Santiago 2362* (FCME); B basada en *R. de Santiago 2363* (FCME).

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Additions to the Knowledge of the Genus *Symplocos* (Symplocaceae) in Ecuador and Peru

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Abstract. Eight Andean species of *Symplocos* Jacq. (Symplocaceae) are described as new to science. They include: *S. condorensis* B. Ståhl, *S. neillii* B. Ståhl, and *S. vanderwerffii* B. Ståhl from southern Ecuador (Zamora-Chinchipe and Morona-Santiago provinces); *S. golondrinae* B. Ståhl from northern Ecuador (Carchi Province); *S. guacamayensis* B. Ståhl from east-central Ecuador (Napo Province); *S. fragilis* B. Ståhl and *S. ovata* B. Ståhl from northern Peru (Amazonas Department); and *S. dolichopoda* B. Ståhl from southern Peru (Cusco Department). *Symplocos spruceana* (Miers) Gürke and *S. nuda* Humb. & Bonpl. are reported as new to Ecuador and Peru, respectively.

Key words: Andes, Ecuador, IUCN Red List, Peru, Symplocaceae, *Symplocos*.

Since the publication of my work on the genus *Symplocos* Jacq. in Ecuador and Peru (Ståhl, 1991, 1993, 1995), a large number of new collections have been presented to me, either as gifts for identification or during visits to different herbaria. The Missouri Botanical Garden Herbarium (MO) has provided the major part of this material, which has considerably increased the knowledge of this still poorly known genus, both with regard to morphological variation and distribution. Several new species have also been encountered. Eight of these are described below, along with some notes on range extensions of two previously known species. With this and a supplementary paper (Ståhl, 2010), which also includes a key to all species known to occur in Bolivia, Ecuador, and Peru, the total number of *Symplocos* species recorded from Ecuador and Peru is now 32 and 37, respectively. However, many unique but incomplete specimens are also available, indicating that several species still remain to be described, especially from Peru.

New Species from Ecuador

1. Symplocos vanderwerffii B. Ståhl, sp. nov. TYPE: Ecuador. Zamora-Chinchipe: near mining camp at Río Tundaime, 78°24′W, 03°34′S, 1100–1400 m, 9 Nov. 2004, *H. van der Werff, B. Gray, W. Quizhpe & J. C. Ronquillo 19431* (holotype, S). Figure 1A, B.

Species a *Symplocote peruviana* (Szyszyl.) Brand foliis glabris, floribus majoribus, corollae lobis strigulosis atque disco glabro, a *S. condorensi* B. Ståhl foliis cartilagineis, petiolis longioribus atque corollae lobis strigulosis differt.

Tree to at least 10 m tall; young shoots and branches glabrous, gray. Leaves petiolate, dark brown when dried; blade elliptic or obovate, 6–12 × 2–5.5 cm, cartilaginous, glabrous on both sides, base attenuate, apex shortly obtuse-acuminate or obtuse, margins entire, slightly revolute; midvein prominent abaxially, impressed adaxially, lateral veins 6 to 11 per side, prominulous abaxially, inconspicuous adaxially, veinlets inconspicuous on both sides; petiole 3–6 mm, glabrous. Inflorescences little-branched panicles, 1–2 cm, borne mainly in the leaf axils of extant leaves, inflorescence branches glabrous; bracts glabrous, very broadly ovate, ca. 1 × 1 mm; flowers 4 to 15 per inflorescence; each flower subtended by 3 bracteoles, these very broadly ovate, 1.2–1.5 × 1.5–1.8 mm, glabrous, the margins ciliolate. Flowers with the calyx glabrous, tube ca. 1 mm, lobes very broadly ovate, ca. 1.5 × 1.5 mm, margins sparsely ciliolate; corolla white, 3.5–4 mm, lobes broadly oblong, 2–2.5 mm wide, densely strigulose on the outside except toward margins, the margins entire; stamens 35 to 40 in 3 rows, filament tube 0.5–0.7 mm, free filaments 0.5–1.8 × 0.3–0.4 mm, minutely and densely papillose; anthers ca. 0.2 × 0.2 mm; disc thick-annular, glabrous; style ca. 0.7 mm; stigma capitate, 2-lobed; ovary 2-locular with 2 ovules in each locule. Fruits ovoid, 9–12 × 6–8 mm, glabrous.

Distribution and habitat. *Symplocos vanderwerffii* is so far known only from two collections made in dense, wet cloud forest on sandstone or mixed sandstone and clay soils in southern Ecuador.

IUCN Red List category. The new species is categorized as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. *Symplocos vanderwerffii* is characterized by cartilaginous, obovate, glabrous leaves; gray branchlets; small flowers arranged in little-branched panicles; and a 2-locular ovary. In leaf shape, it is similar to *S. peruviana* (Szyszyl.) Brand, from which it differs in the glabrous leaves and larger flowers

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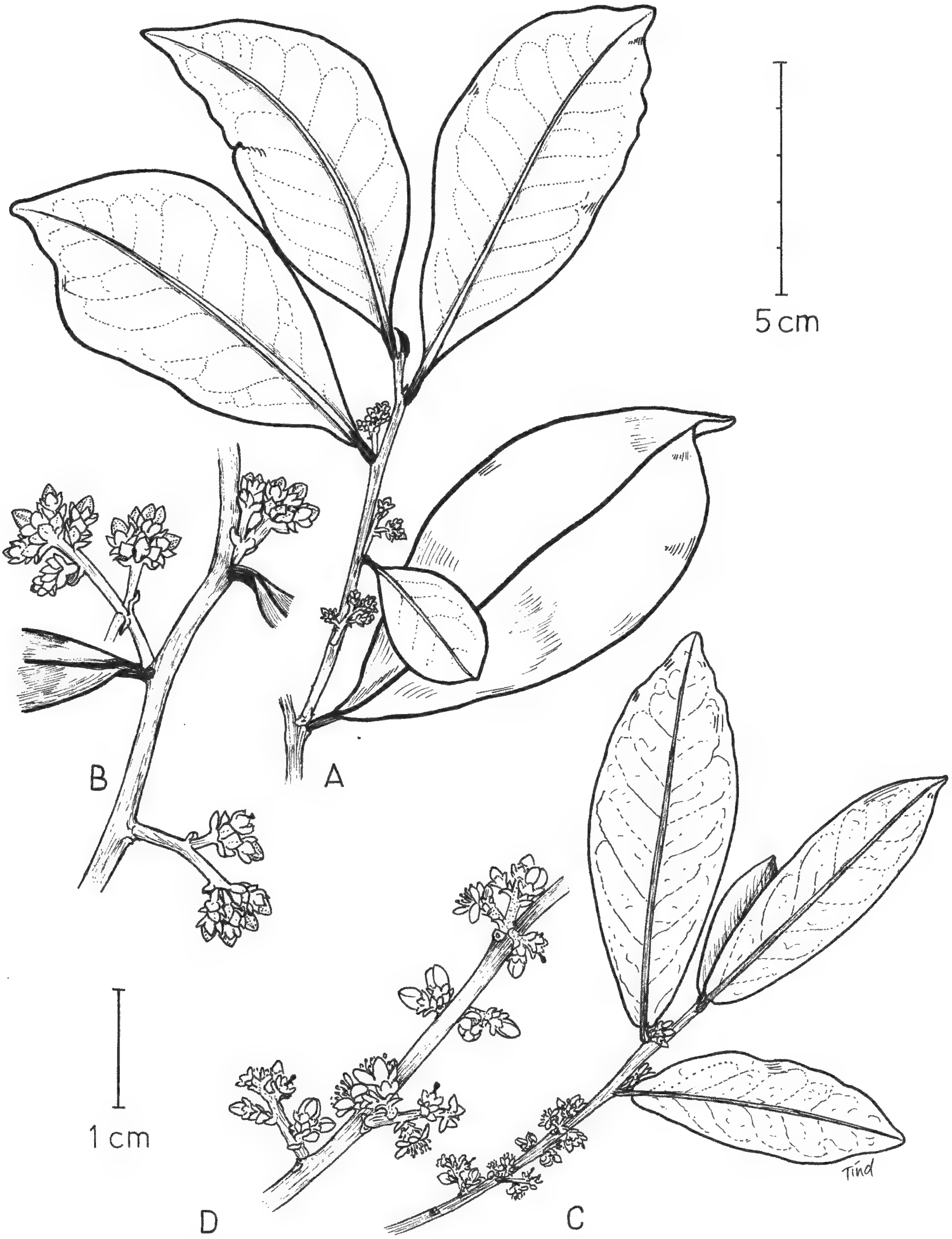

Figure 1. *Symplocos vanderwerffii* B. Ståhl (A, B) and *S. condorensis* B. Ståhl (C, D). —A, C. Habit. —B, D. Close-up of flowering branch. A, B drawn from the holotype *H. van der Werff et al. 19431* (S); C, D drawn from the holotype *E. Freire et al. 4379* (QCNE).

(corolla 3.5–4 mm vs. 2.2–3 mm long) with strigulose corolla lobes, as well as by having fewer stamens (35 to 40 vs. 50 to 65) and a glabrous disc. In floral characters, it is similar to *S. condorensis* B. Ståhl, described in this paper, but differs from that species in the strigulose corolla lobes and several vegetative characters, such as the much thicker leaves and longer petioles.

Paratype. ECUADOR. **Zamora-Chinchipe:** Cordillera del Cóndor, upper Río Wawaime watershed, tributary of Río Quimi, 78°26′W, 03°34′S, 1320 m, 20 Sep. 2007, *D. Neill, C. Davidson & S. Christoph 15898* (QCNE).

2. Symplocos condorensis B. Ståhl, sp. nov. TYPE: Ecuador. Prov. Zamora-Chinchipe: El Pangui, Cordillera del Cóndor, 1 km S of military camp Cóndor Mirador, 78°03′W, 03°23′S, 2000 m, 16 Dec. 2000, *E. Freire 4379* (holotype, QCNE; isotypes, MO, S). Figure 1C, D.

Species a *Symplocote peruviana* (Szyszyl.) Brand foliis vulgo obovatis vel oblanceolatis, petiolis longioribus, disco glabro atque staminibus paucioribus, a *S. fuscata* B. Ståhl foliis vulgo tenuioribus et longioribus, floribus minoribus atque ovario 3-loculari differt.

Shrub or small tree to 5(–8) m tall, stem to 20 cm diam.; young shoots and branches glabrous, dark brown. Leaves short-petiolate, dark brown when dried; blade obovate to oblanceolate, or sometimes elliptic, 6–9 × 1.8–3.4 cm, coriaceous, glabrous on both sides, base short-attenuate or truncate, apex shortly obtuse-acuminate or obtuse, margins entire, slightly revolute; midvein red in fresh leaves, prominent abaxially, impressed adaxially, lateral veins 6 to 8 per side, these and veinlets prominulous abaxially, lateral veins slightly impressed adaxially, veinlets inconspicuous or invisible adaxially; petiole 1–3 mm, glabrous, reddish when fresh. Inflorescences little-branched panicles or racemes, 4–6 mm, borne on branchlets beneath the foliage and in leaf axils of the lowermost leaves, inflorescence branches glabrous or very sparsely strigulose; bracts glabrous, broadly ovate, ca. 1.5 × 1.5 mm; flowers 4 to 8 per inflorescence; each flower subtended by 3 bracteoles, these very broadly ovate, 1–1.2 × 1–1.2 mm, glabrous or strigulose on midvein, the margins entire or ciliolate. Flowers with the calyx glabrous, tube ca. 1 mm, lobes very broadly ovate, ca. 0.8 × 1 mm, margins ciliolate; corolla white, cream-white, or pink, glabrous, 2.5–3 mm, lobes oblong, 1–1.3 mm wide, margins entire; stamens 30 to 40 in 3 rows, tube 0.5–0.7 mm, free filaments 0.7–2 × ca. 0.8 mm, somewhat papillose; anthers ca. 0.2 × 0.3 mm; disc almost dome-shaped, glabrous; style ca. 1 mm, glabrous; stigma thicker than style, ± flattened; ovary 2-locular with 2 ovules in each locule. Fruits not seen.

Distribution and habitat. *Symplocos condorensis* is known from two collections made in a small sandstone area with low forest and dense scrub at the crest of the Cordillera del Cóndor, near the Ecuador–Peru border.

IUCN Red List category. The new species is categorized as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. Having comparatively small flowers arranged in little-branched panicles or racemes, this new species keys to *Symplocos peruviana* in my treatment of *Symplocos* from Peru (Ståhl, 1993). It differs from that species in leaf shape, in having longer petioles, and in several floral characters, such as the glabrous disc and the possession of fewer stamens (30 to 40 vs. 50 to 65). In leaf features it is also similar to *S. fuscata*, which also occurs in southern Ecuador. However, that species has usually much coarser and broader leaves, and differs also by having larger, fasciculate flowers (corolla 5–5.5 mm vs. 2.5–3 mm long) and a 3-locular ovary.

Paratype. ECUADOR. **Zamora-Chinchipe:** Cordillera del Cóndor, El Pangui, 2 km N of Cóndor Mirador, 78°23′W, 03°37′S, 1975 m, 6 Sep. 2003, *D. Neill, E. Rodríguez, W. Quizhpe & J. Homeier 14423* (QCNE).

3. Symplocos neillii B. Ståhl, sp. nov. TYPE: Ecuador. Morona-Santiago: Cordillera del Cóndor, Cerro Chankinias, ridge S of Río Warintza, 78°19′W, 03°15′S, 2500 m, 16 Dec. 2002, *D. Neill 14165* (holotype, QCNE; isotypes, MO, S). Figure 2A–C.

Species a *Symplocote mezii* Szyszyl. surculis juvenibus laevibus glabris, foliis subtus et floribus glabris atque laminis foliaribus ad apices retusis, a *S. fuscata* B. Ståhl laminis foliaribus ellipticis ad margines denticulatis atque floribus majoribus differt.

Shrub or small tree to 5 m tall; young shoots and branches glabrous, brown. Leaves petiolate, distinctly discolored, at least when dried, adaxial side dark, matte brown, abaxial side light, yellowish brown; blade elliptic, 3.5–8 × 1.5–4 cm, cartilaginous, glabrous on both sides, base truncate or short-attenuate, apex obtuse to rounded, often slightly retuse, margins often revolute, often distinctly so, entire from the middle to base, denticulate from above the middle to the apex, with 6 to 10 teeth per side; midvein prominent abaxially, impressed adaxially, lateral veins 5 to 7 per side, these and veinlets prominulous abaxially, usually slightly impressed adaxially; petiole 2–5 mm, glabrous, canaliculate. Inflorescences fasciculate, sessile or with peduncle to 5 mm, glabrous, borne in the axils of extant leaves; bracts 2, ovate to broadly ovate, 2.5–3.5 × 1.8–3 mm, glabrous, ciliolate at margins and on midvein; flowers 2 to 4 per inflorescence; each flower subtended by 2 bracteoles, these very broadly ovate, 2–2.5 × 1.8–2.2 mm, sparsely strigulose on midvein, other parts glabrous, margins ciliolate. Flowers with the calyx glabrous, tube 1–1.2 mm, lobes very broadly ovate, 2–2.5 × 2–3 mm, margins ciliolate; corolla pink, 5–7 mm, glabrous, lobes broadly oblong, 3–3.5 mm wide, margins entire; stamens 50 to 65 in 3 or 4 rows, filament tube 3.5–5 mm, stamens of inner whorl lacking free

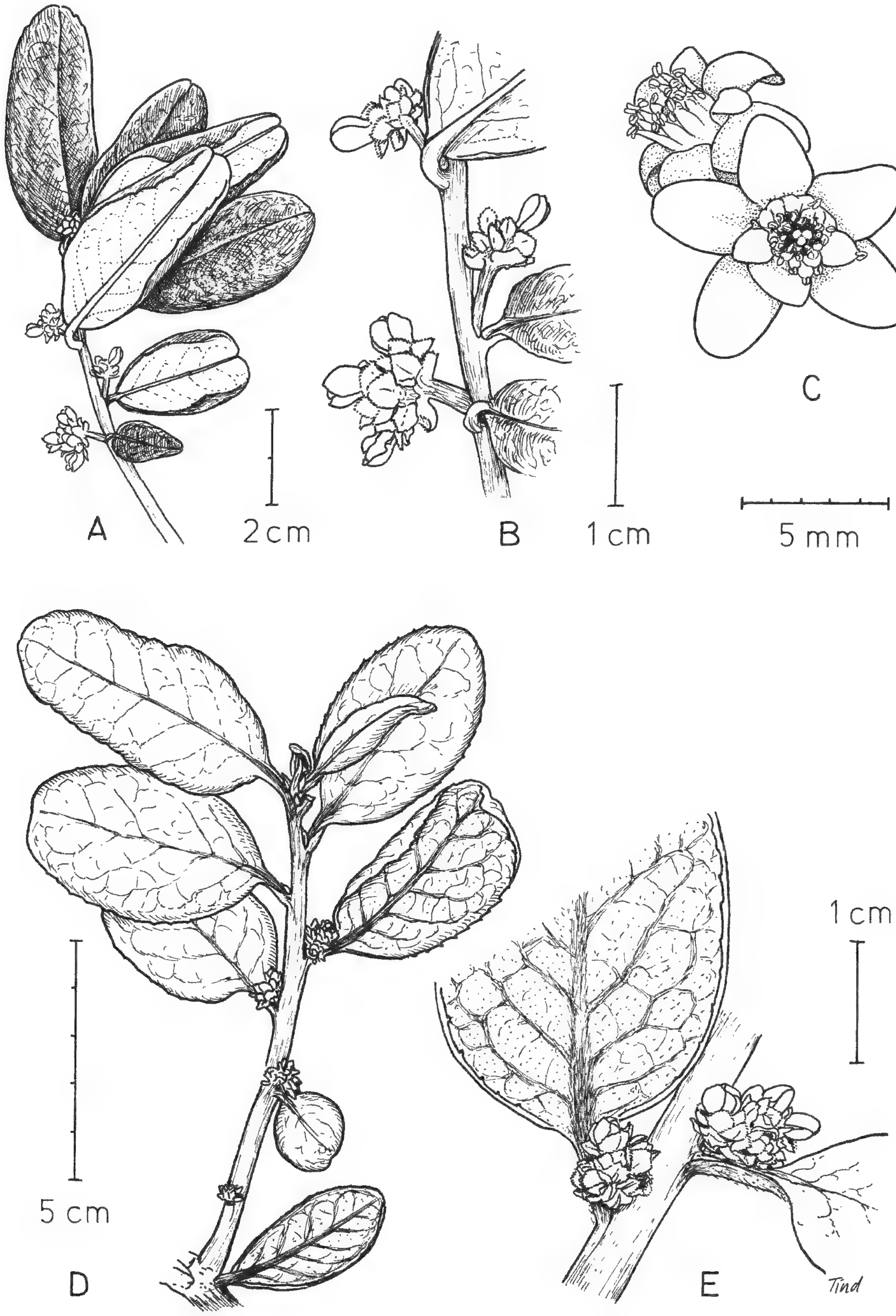

Figure 2. *Symplocos neillii* B. Ståhl (A–C) and *S. golondrinae* B. Ståhl (D, E). —A, D. Habit. —B, E. Close-up of flowering branch. —C. Flowers. A–C drawn from the isotype *D. Neill et al. 14165* (S); D, E drawn from the isotype *W. Palacios & J. L. Clark 12513* (S).

filaments except for the constricted, terminal part, stamens of outer whorl with free filaments ca. 1 × 0.4–0.6 mm, faintly papillose; anthers 0.2–0.3 × 0.2–0.3 mm; disc annular, pilose; style ca. 4 mm, pilose at base; stigma capitate, 3-lobed; ovary 3-locular with 2 ovules in each locule. Fruits ovoid to subcylindrical, 8–10 × 5–6 mm, style base sparsely to densely strigulose, other parts glabrous.

Distribution and habitat. *Symplocos neillii* has been collected in scrub or open páramo vegetation on or near mountain ridges. At least one of the collections (*Neill et al. 13074*) was made in a sandstone area.

IUCN Red List category. The new species is categorized as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. *Symplocos neillii* is similar to *S. mezii* Szyszyl. but differs from that species by having glabrous and smooth young shoots (not strigose and rugose), distinctly revolute leaf margins (at least in herbarium material), and glabrous (not strigulose) abaxial leaf surfaces and floral parts. It is also similar to *S. fuscata*, a species which differs from *S. neillii* in the flat, entire leaf margins, obovate rather than elliptic leaves, and the somewhat smaller, white flowers (corolla 5–5.5 mm vs. 5–7 mm long).

Paratypes. ECUADOR. **Morona-Santiago:** Cordillera del Cóndor, 15–20 km SSE of Comunidad Warints on trail toward crest, 78°19′W, 03°15′S, 2400–2700 m, 16 Dec. 2002, *J. L. Clark & L. Jost 7017* (S); same general area, on trail to top of Cerro Chankinias, 78°17′W, 03°14′S, 2200 m, 15 Oct. 2002, *C. Kajekai 44* (S); Cordillera de Huaracayo, Cerro Ijiach Naint, E of Río Coangas and Shuar village of Tinkimints, 78°10′W, 03°15′S, 1950 m, 20 Mar. 2001, *D. Neill, P. Berry, J. Manzanares & L. Jost 13074* (S). **Zamora-Chinchipe:** Cordillera de Nanquipa, Cerro Colorado, ca. 8 km SSE of Nambija, 20 km ESE of Zamora, 78°46′W, 04°07′S, 2700 m, 18 Feb. 2002, *D. Neill, W. Quizhpe, J. Manzanares, A. Hirtz, T. DeLinks & C. Cole 13761* (QCNE, S); Cordillera del Cóndor, Yantzaza, plateau on Peru–Ecuador border, 78°28′W, 03°53′S, 2420 m, 15 Mar. 2008, *D. Neill & W. Quizhpe 16139* (QCNE).

4. Symplocos golondrinae B. Ståhl, sp. nov. TYPE: Ecuador. Carchi: El Gualtal, crest of Cerro Golondrinas, 78°08′W, 00°51′N, 3000 m, 21 Aug. 1994, *W. Palacios & J. L. Clark 12513* (holotype, QCNE; isotypes, MO, S). Figure 2D, E.

Species a *Symplocote clethrifolia* B. Ståhl floribus minoribus atque disco et ramulis glabris differt.

Tree to 4 m tall; young shoots and branches brown, smooth, turning grayish with age. Leaves petiolate; blade elliptic or oblong, 3–6 × 2.2–3.5 cm, cartilaginous, sparsely strigose abaxially, mainly on veins, glabrous adaxially, base short-attenuate or truncate, apex rounded, margins revolute, denticulate with 15 to 20 teeth per side; lateral veins 5 or 6 per side, midvein, lateral veins, and veinlets on abaxial side prominent and verrucose, impressed adaxially; petiole 4–6 mm, glabrous, flattened, narrowly winged. Inflorescences fasciculate, sessile, borne in axils of extant leaves and along branchlets beneath the foliage; flowers 3 to 5 per inflorescence; each flower subtended by 3 bracts and 2 bracteoles, these very broadly ovate, 2.2–3 × 2.5–2.8 mm, strigulose on midvein toward apex, otherwise glabrous, margins ciliolate. Flowers with the calyx glabrous, tube ca. 1.2 mm, lobes very broadly ovate, 1.2–2.2 × 2–2.5 mm, margins ciliolate; corolla glabrous, white, ca. 3.5 mm, lobes 5, broadly oblong, 1.2–2 mm wide, margins entire; stamens 45 to 55 in 3 rows, free filaments 0.2–0.4 × ca. 0.2 mm, smooth; anthers ca. 0.2 × 0.2 mm; disc dome-shaped to flat, glabrous; style ca. 1.2 mm, glabrous; stigma irregularly 3-lobed; ovary 3-locular with 2 ovules per locule. Mature fruits not seen.

Distribution and habitat. The species is known solely from a scrub páramo area on Cerro Golondrinas in northern Ecuador.

IUCN Red List category. The new species is categorized as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. *Symplocos golondrinae* is similar to *S. clethrifolia* B. Ståhl of southern Ecuador, especially in such leaf features as the prominent verrucose veins on the abaxial leaf surface. It differs from that species by having considerably smaller flowers (corolla ca. 3.5 mm vs. 5–8 mm long), the glabrous (not pilose) disc, and glabrous (not tomentose) young shoots.

Paratypes. ECUADOR. **Carchi:** Cerro Golondrinas, northern ridge, 78°08′W, 00°51′S, 3000–3060 m, 24 July 1994, *B. Boyle, A. Boyle, J. Bradford & N. Skinner 3380* (QCNE); same locality and date, *B. Boyle, A. Boyle, J. Bradford & N. Skinner 3393* (QCNE).

5. Symplocos guacamayensis B. Ståhl, sp. nov. TYPE: Ecuador. Napo: Cordillera de los Guacamayos, E sector, betw. El Mirador & rd. to La Virgen, 77°51′W, 00°38′S, 2300 m, 12–14 Jan. 1999, *H. Vargas & E. Narváez 3578* (holotype, QCNE; isotypes, MO, S). Figure 3C, D.

Species a *Symplocote nuda* Humb. & Bonpl. floribus minoribus, staminibus paucioribus atque foliis glabris differt.

Tree to 18 m tall; young shoots and branches glabrous, dark brown to black, turning gray. Leaves petiolate; blade obovate to elliptic, 5–8.5 × 2–3.5 cm, coriaceous, glabrous on both sides, base attenuate or shortly attenuate, apex acuminate with acumen 0.8–1.5 cm, margins denticulate toward apex, with 3 to 5 teeth per side, otherwise entire; midvein prominent abaxially, slightly impressed adaxially, lateral veins 5 to 7 per side, these and veinlets rather conspicuous, prominulous on both sides; petiole 0.6–0.8 cm, flat or somewhat canaliculate, glabrous. Inflorescences fasciculate, borne in leaf axils of extant leaves, pedicels 1–2 mm. Flowers approximately 3 per inflorescence; each flower subtended by 1 or 2 bracts and 3 bracteoles; bracts

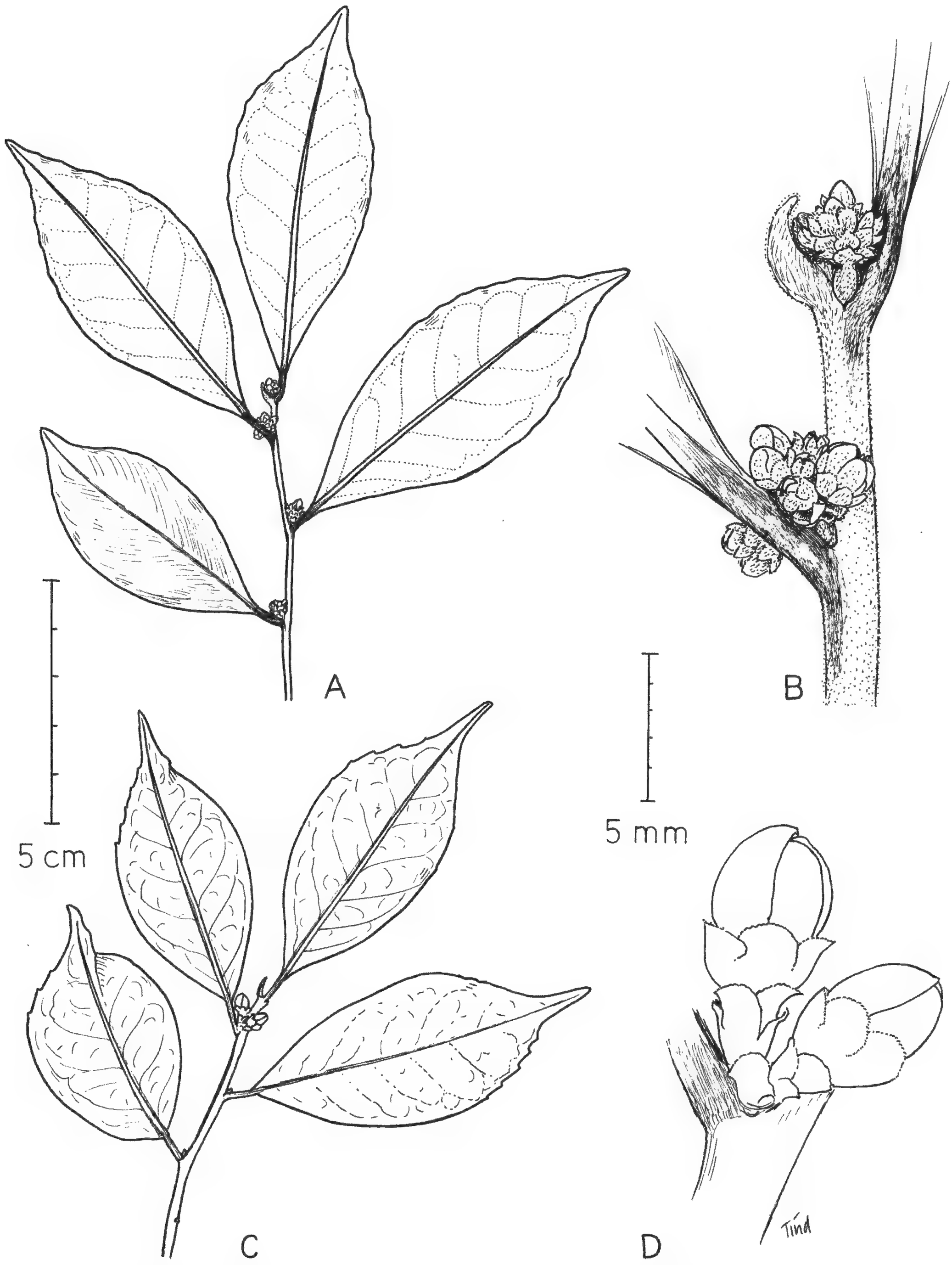

Figure 3. *Symplocos fragilis* B. Ståhl (A, B) and *S. guacamayensis* B. Ståhl (C, D). —A, C. Habit. —B, D. Close-up of inflorescences. A, B drawn from the holotype *C. Díaz et al. 7228* (S); C, D drawn from the isotype *H. Vargas & E. Narváez 3578* (S).

glabrous, broadly to very broadly ovate, ca. 1 × 1–1.2 mm, margins ciliolate; bracteoles glabrous, very broadly ovate, 1–1.5 × 1.2–2 mm, with size increasing toward the flower, margins ciliolate. Flowers with the calyx glabrous, tube ca. 1.5 mm, lobes very broadly ovate, ca. 1.5 × 2 mm, margins ciliolate; corolla glabrous, color unknown, to 6 mm long, lobes 2.5–3 mm wide, margins entire; stamens

35 to 40 in 3 rows, free filaments 1–2 × 0.3–0.4 mm, smooth; anthers ca. 0.4 × 0.4 mm; disc annular, pilulose; style 3.5–4 mm, glabrous; stigma capitate, 3-lobed; ovary 2- or 3-locular. Fruits not seen.

Distribution and habitat. *Symplocos guacamayensis* is known only from two collections made in primary, montane rainforest on the east Andean slopes of east-central Ecuador.

IUCN Red List category. The new species is categorized as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Vernacular name. Huila (*H. Vargas & E. Narváez 3578*).

Discussion. In leaf shape and habit as a large tree, *Symplocos guacamayensis* is similar to *S. nuda* Humb. & Bonpl. It differs from that species in having much smaller flowers (corolla ca. 6 mm vs. 11–13 mm long) with fewer stamens (35 to 45 vs. 80 to 90), and glabrous leaves (not pilose-strigose abaxially).

Paratype. ECUADOR. **Napo:** Cordillera de Guacamayos, ca. 6 km SE of Cosanga, 77°50′W, 00°38′S, 1900 m, 1 Apr. 2006, *J. Homeier, D. Trujillo & M. Unger 2229* (QCA).

New Species Report from Ecuador

1. Symplocos spruceana (Miers) Gürke, Pflanzenr. 4(1): 170. 1890. TYPE: Peru. *R. Spruce 4845* (holotype, BM; isotypes, F, G, GH, K, NY, P, W).

Discussion. *Symplocos spruceana* is a poorly known species, previously recorded only from lower montane forest in northern Peru. Additional collections have now been made in similar habitats in eastern Ecuador. The Ecuadorian material differs in the smaller leaves and possibly smaller fruits, making the distinction from the high Andean *S. bogotensis* Brand somewhat problematic. However, the leaves of the latter species are generally much smaller (leaf blades 2.5–6 cm vs. 10–18 cm long), thicker, and comparatively broader (length:width ratio 1.5–2 vs. 2–3).

Specimens examined. ECUADOR. **Napo:** E side of Cordillera de Galeras, 77°31′W, 00°51′S, 1600 m, *D. Neill & H. Vargas 10551* (QCNE, S); same general area, trail to Huamaní, 77°31′W, 00°39′S, 1350–1650 m, *A. Alvarez et al. 1653* (S), *1688* (QCNE), *1724* (QCNE); Sumaco-Galeras National Park, 77°32′W, 00°49′S, 1590 m, *J. Hofmeier et al. 3612* (QCNE). PERU. **San Martín:** Tarapoto, *R. Spruce 4845* (BM, F, G, GH, K, NY, P, W); San Roque, *L. Williams 7433* (A, F, US).

New Species from Peru

1. Symplocos fragilis B. Ståhl, sp. nov. TYPE: Peru. Amazonas: Prov. Bagua, Imaza, Aguaruna Putuim community, hills SW of Putuim, 760 m, 24 Sep. 1994, *C. Díaz, A. Peña & P. Atamain 7228* (holotype, S). Figure 3A, B.

Species a *Symplocote condorensi* B. Ståhl foliis ad bases attenuatis, petiolis longioribus, inflorescentiis fasciculatis atque floribus strigulosis, a *S. peruviana* (Szyszyl.) Brand inflorescentiis fasciculatis, staminibus numerosioribus atque ovario triloculari differt.

Tree to 20 m tall; young shoots and branchlets inconspicuously but densely puberulent, brown to light brown, smooth. Leaves petiolate; blade oblanceolate to elliptic, 6–10 × 2.5–3.7 cm, coriaceous, glabrous on both sides, base attenuate, apex acuminate with acumen 0.5–1.2 mm, margins vaguely crenate toward apex, eglandular; midvein prominent abaxially, slightly impressed adaxially, lateral veins 5 to 7 per side, these and veinlets inconspicuous, prominulous abaxially; petiole 0.4–0.6 cm, distinctly darkened, flat, glabrous. Inflorescences fasciculate, sessile or very shortly pedunculate, borne in the leaf axils of extant leaves; flowers 8 to 12 per inflorescence; each flower subtended by 1 bract and 2 bracteoles, inserted just beneath the calyx, these strigulose on outside, ciliolate at margins and very broadly ovate, bract ca. 1.2 × 1.2 mm, bracteoles ca. 0.7 × 0.7 mm. Flowers with the calyx sparsely strigulose, tube ca. 0.5 mm, lobes very broadly ovate, ca. 1 × 1.2 mm, margins ciliolate; corolla cream, ca. 3 mm, lobes 5, broadly oblong, 1.2–1.5 mm wide, strigulose on outside; stamens 25 to 30 in 2 or 3 rows, free filaments 0.2–1 × ca. 0.2 mm, papillose; anthers ca. 0.2 × 0.2 mm; disc annular, densely strigulose; style glabrous, ca. 0.7 mm; stigma capitate, vaguely lobed; ovary 2-locular with 3 ovules per locule. Fruits not seen.

Distribution and habitat. *Symplocos fragilis* is restricted to premontane and lower montane rainforest of northeastern Peru.

IUCN Red List category. The new species is categorized as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. This new species has many features in common with *Symplocos condorensis*, notably the 2-locular ovary and the leaves and flowers of similar size. However, *S. condorensis* has the leaf blades truncate or short-attenuate at the base (vs. distinctly attenuate in *S. fragilis*), shorter petioles (0.1–0.3 cm vs. 0.4–0.6 cm), paniculate inflorescences (not fasciculate), and glabrous floral parts (not sparsely strigulose). *Symplocos fragilis* also resembles *S. peruviana*, but differs from that species by having fasciculate inflorescences (not paniculate), flowers with fewer stamens (25 to 30 vs. 50 to 65), and a 2-locular ovary. In addition, the rust-colored, more or

less rugose branches of *S. peruviana* seem to set that species well apart from *S. fragilis*.

Paratypes. PERU. **Amazonas:** Prov. Bagua, Imaza, Cerro Apág, Quebrada Kusú, 550 m, 19–21 Nov. 1996, *C. Díaz, J. Campos, A. Peña & D. Chamik 8553, 8651, 8653* (S); Prov. Luya, Jaipe, "El Paraiso," 1700 m, 31 May 1989, *C. Díaz & J. Campos 3584* (S).

2. Symplocos ovata B. Ståhl, sp. nov. TYPE: Peru. Amazonas: Prov. Luya, Camporedondo, Tullanya, Pascana, 78°20′W, 06°06′S, 2250–2360 m, 4 Dec. 1996, *C. Díaz & A. Peña 8808* (holotype, S). Figure 4A, B.

Species a *Symplocote patazensi* Mansf. foliis pilosulis vel glabris, inflorescentiis lateralibus, ovario triloculari atque floribus minoribus differt.

Tree to 25 m tall; young shoots and branches densely pilulose, pale reddish brown. Leaves petiolate; blade ovate, 5–14 × 4–9 cm, coriaceous, pilulose abaxially, sparsely pilulose to glabrous adaxially, base truncate or somewhat cordate, apex rounded, margins entire or vaguely repand, eglandular; midvein prominent abaxially, ± level with surface adaxially, lateral veins 4 to 6 per side, prominent abaxially, ± level with surface adaxially, veinlets rather inconspicuous; petiole 0.5–1 cm, densely pilulose, canaliculate. Inflorescences paniculate, lateral, mainly borne beneath the foliage, solitary or in groups of 2 to 4, rachis and inflorescence branches densely pilulose; flowers in groups of 3 to 6, condensed mainly at the tips of the inflorescence branches; each flower subtended by 1 bract and 2 bracteoles, these densely strigulose, ovate; bract ca. 1 × 1 mm, bracteoles ca. 1.2 × 1.2 mm. Flowers with the calyx densely strigulose, tube ca. 1.2 mm, lobes very broadly ovate, ca. 1 × 1.3 mm; corolla glabrous, color unknown, ca. 3 mm, lobes broadly oblong, 1.3–1.7 mm wide; stamens 35 to 45 in 2 or 3 rows, free filaments 0.5–1.7 mm, papillose; anthers ca. 0.3 × 0.3 mm; disc annular, densely pilulose; style glabrous, 1.2–1.5 mm; stigma 3-lobed; ovary 3-locular with 3 ovules per locule. Fruits not seen.

Distribution and habitat. Symplocos ovata is known only from a single locality of montane forest in northern Peru.

IUCN Red List category. The new species is categorized as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. Symplocos ovata keys to *S. patazensis* Mansf. in my treatment of Symplocaceae in Peru (Ståhl, 1993), the two species having similar wide, distinctly petiolate leaves and paniculate inflorescences. However, *S. ovata* is readily distinguished from *S. patazensis* because of its less dense pubescence, lateral rather than terminal inflorescences, and somewhat smaller flowers (corolla ca. 3 mm vs. ca. 4 mm long) with fewer stamens (35 to 45 vs. 50 to 60) and a 3-locular ovary (not 4-locular).

Paratype. PERU. **Amazonas:** Prov. Luya, Camporedondo, Tullanya, Pascana, 78°20′W, 06°06′S, 2250–2360 m, 4 Dec. 1996, *R. Vásquez & R. Rojas 21960* (S).

3. Symplocos dolichopoda B. Ståhl, sp. nov. TYPE: Peru. Cusco: Prov. Urubamba, ca. 112 km from Cusco on railroad to Machu Picchu, 72°31′W, 13°09′S, 1050–1300 m, 18 Nov. 1987, *P. Nuñez V. 8630* (holotype, S). Figure 5A–C.

Species a *Symplocote robusta* B. Ståhl indumento multo densiore atque floribus majoribus differt.

Tree to at least 8 m tall; young shoots and branchlets glabrous or very sparsely strigulose, brown, the bark somewhat rugose. Leaves petiolate; blade obovate, subrotund, or broadly elliptic, 7–17 × 5–8.5 cm, coriaceous, glabrous on both sides or sparsely strigulose abaxially, base short-attenuate, apex rounded or retuse, sometimes acute, margins entire or vaguely and sparsely serrate, eglandular or with 3 to 5 glands per side along the upper half of the leaf; midvein prominent abaxially, level or somewhat impressed adaxially, lateral veins 4 to 7 per side, prominent abaxially, level with leaf surface adaxially, veinlets rather conspicuous, at least abaxially; petiole 0.8–2 cm, canaliculate, sparsely strigulose. Inflorescences paniculate, lateral, borne in groups of 2 or 3 in leaf axils of extant leaves, 1–1.5 cm, rachis and inflorescence branches strigulose; flowers 10 to 15 per inflorescence; each flower subtended by 3 or 4 bracts and several bracteoles, these gradually diminishing in size toward base, broadly ovate, 1–1.2 × 1.2–1.5 mm, strigulose, ciliate at margins. Flowers with the calyx glabrous, tube ca. 1 mm, lobes very broadly ovate, ca. 1.2 × 1.2 mm, margins ciliolate; corolla glabrous, only seen in large buds, 3.5–4 mm, lobes 5, broadly oblong, 1.5–2 mm wide, ciliate at margins and at tips; stamens 12 to 15 in 2 rows, free filaments 0.7–1.5 mm, papillose; anthers ca. 0.4 × 0.4 mm, papillose; disc dome-shaped, sparsely strigulose; style ca. 1 mm, glabrous; stigma capitate, indistinctly lobed; ovary 3-locular with 2 ovules per locule. Fruits narrowly ellipsoid to cylindrical, 15–20 × 8–12 mm, glabrous, smooth.

Distribution and habitat. Symplocos dolichopoda is known only from central Peru, where it has been collected in montane forest in the east Andean cordillera.

IUCN Red List category. The new species is categorized as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

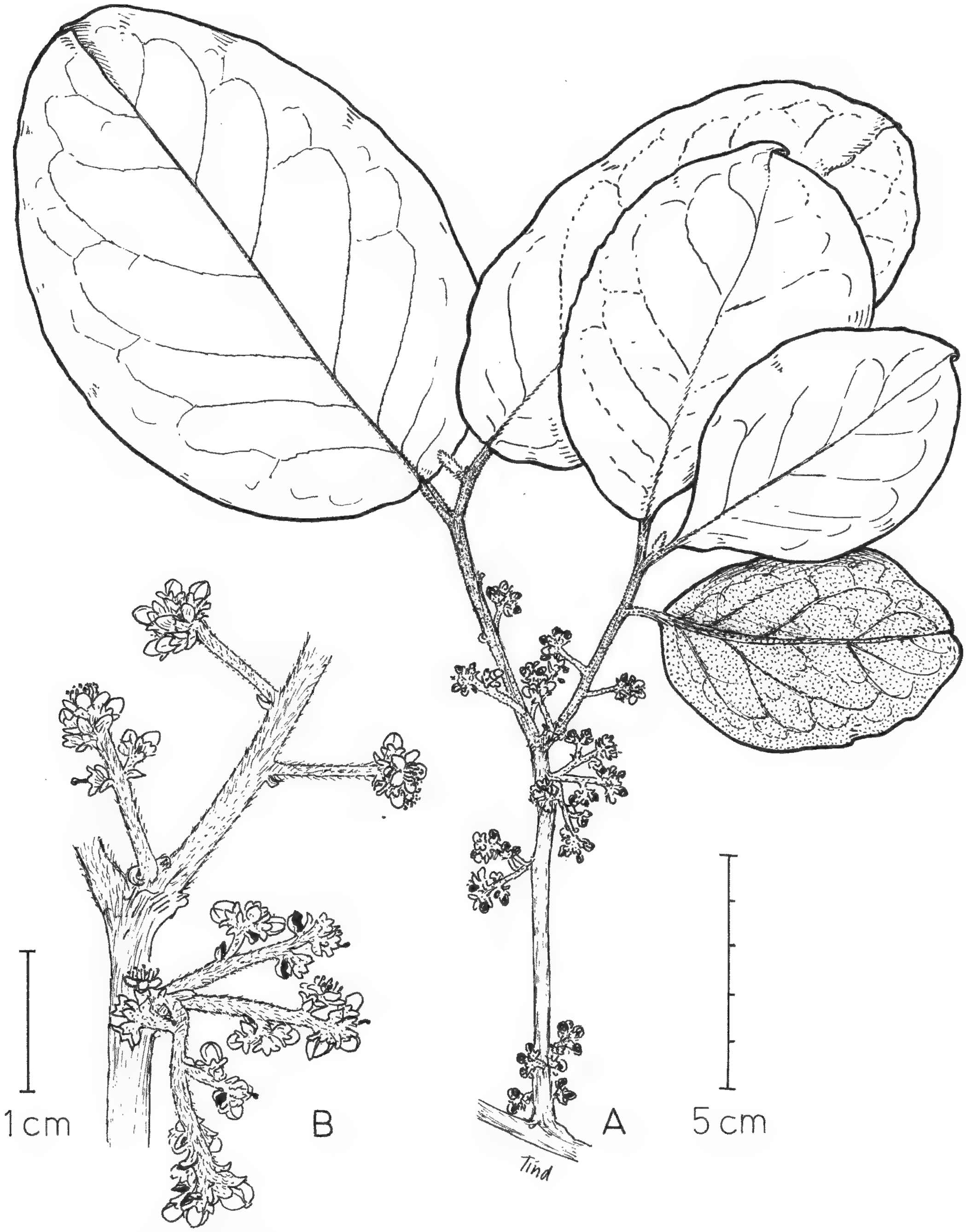

Figure 4. *Symplocos ovata* B. Ståhl. —A. Habit. —B. Inflorescences. Drawn from the holotype *C. Díaz & A. Peña 8808* (S).

Discussion. Although it is represented by rather scanty material lacking open flowers, I do not hesitate to describe this species as new. *Symplocos dolichopoda* is distinguished by the large, broad leaves and long petioles, distinctly ciliate margins of the bracts and calyx lobes, few stamens, and papillose anthers. It may well have its closest relative in *S. robusta* B. Ståhl, which occurs in La Paz Department, Bolivia (Ståhl, 1994), and which is also characterized by large, long-petiolate leaves. However, *S. dolichopoda*

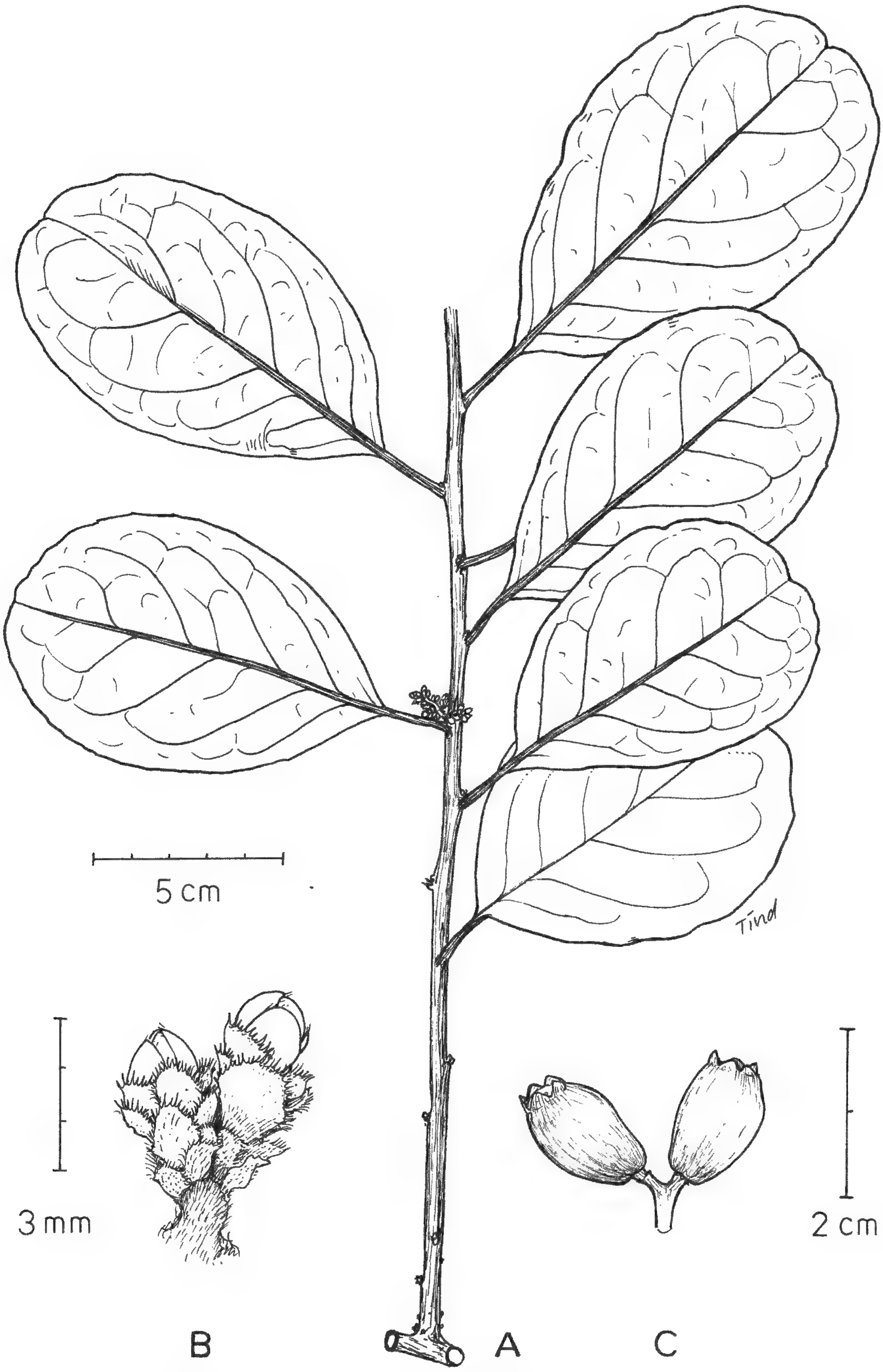

Figure 5. *Symplocos dolichopoda* B. Ståhl. —A. Habit. —B. Inflorescence. —C. Fruits. A, B drawn from the holotype *P. Núñez 8630* (S); C drawn from the the paratype *P. Núñez 8934* (S).

differs from that species in having a different and much sparser vestiture, if any, on leaves and young shoots (sparsely strigulose, not densely tomentose) and smaller flowers (corolla 3.5–4 cm vs. ca. 5 cm long).

Paratype. PERU. **Cusco:** Prov. Urubamba, Machu Picchu, 115 km from Cusco, 72°31′W, 13°09′S, 2100 m, 4–6 Apr. 1988, *P. Núñez V. 8934* (S).

New Species Report for Peru

1. Symplocos nuda Humb. & Bonpl., Pl. Aequinoct. 1: 195. 1808. TYPE: Ecuador. Loja: Loja, *A. Bonpland 3370* (lectotype, designated by Ståhl, 1991: 20, P; isotypes, F, G, P-HBK).

Discussion. *Symplocos nuda* has hitherto been known solely from the west Andean slopes of central and southern Ecuador (Ståhl, 1991). However, in recent years it has also been collected in similar habitats in northern and southern Peru.

Specimens examined. PERU. **Amazonas:** Tingo, Cuelap, 1900 m, *R. Vásquez et al. 25449* (S). **Cusco:** Prov. Urubamba, S of Machu Picchu, 72°31′W, 13°09′S, 2200 m, *P. Núñez & J. Arizabal 14217* (S). **Piura:** Prov. Morropón, Mijal Forest, 79°44′W, 05°03′S, 2600 m, *K. Hoenselaar et al. 103* (S); Cerro Aypate, 49 km E of Ayabaca, 79°32′W, 04°35′S, 2740–2760 m, *A. Gentry et al. 74983* (S).

Acknowledgments. I thank Kirsten Tind (C) for providing the excellent illustrations and John L. Clark (UNA) for sending me images of *Symplocos neillii*. I also thank the Missouri Botanical Garden Herbarium for sending their new collections of *Symplocos*, thereby making this study possible, and Henk van der Werff and an anonymous reviewer for helpful comments on the manuscript.

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Rubiacearum Americanarum Magna Hama Pars XXII: Notable New Species of South American *Coutarea*, *Morinda*, *Patima*, and *Rosenbergiodendron*

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Abstract. Although *Appunia* Hook. f. has been synonymized by some recent authors with *Morinda* L., it is here provisionally recognized as a Neotropical genus, with the new species *A. megalantha* C. M. Taylor & Lorence found in wet lowland forests of northwestern Colombia, northern Peru, and perhaps Ecuador and easily separated from other species of *Appunia* by its climbing habit and relatively large corollas with six lobes. Two new species of *Coutarea* Aubl. with actinomorphic corollas expand its known diversity in seasonal and dry inter-Andean valleys, with *C. coutaportloides* C. M. Taylor of southwestern Ecuador and *C. fuchsioides* C. M. Taylor of northeastern Peru both similar to *C. andrei* Standl. A second species of *Patima* Aubl., *P. minor* C. M. Taylor (Hamelieae) from Guyana, doubles the number of species known and expands the morphological variation in the genus to include 4-merous flowers. A fourth species of *Rosenbergiodendron* Fagerl., *R. reflexum* C. M. Taylor & Lorence from Peru, has subglobose fruits and relatively large corollas, ca. 34.5 cm long.

Key words: *Appunia*, Brazil, CCE complex, *Coutarea*, Ecuador, Gardenieae, Guyana, Hamelieae, IUCN Red List, *Morinda*, Morindeae, *Patima*, Peru, *Rosenbergiodendron*, Rubiaceae.

During study of specimens of Neotropical Rubiaceae, the five new species described below were discovered. These species are notable in their expansion of the morphological range, species diversity, and/or biogeography of their respective genera.

The study presented here is taxonomic and floristic: the objective is enumeration of the species that belong to various Rubiaceae genera and the species that occur in the area of tropical Central and South America. The methods employed here correspond only to this objective, with this study based on survey of specimens collected over a number of years using varied survey methods addressing different questions. The specimens that here outline the range and commonness of these new species were located through a non-exhaustive survey of particular herbaria, and no field studies have been done targeting the occurrence of these species. Thus the floristic information presented here is a simplified presence report based on incomplete survey of the data available for incompletely known regions (Schulman et al., 2007). Knowledge of the range of a species is essential to understanding the threats to its existence and thus to understanding its actual conservation status; no claim is made here to accurately describe the entire geographic range of any of these new species. Knowledge of the existence of a species based only on one or a few collections also does not provide a reasonable estimate of its population size, which is also essential to understanding its actual conservation status. Pro forma conservation assessments are provided here for these newly described species according to IUCN categories (IUCN, 2001) following current taxonomic practices, but these assessments are not rigorous or formally submitted to the IUCN and the basis for these assessments should be carefully evaluated by the reader.

Appunia

The genera *Morinda* L. and *Appunia* Hook. f. (Morindeae) are characterized by opposite to verticillate leaves; tissues with raphides; interpetiolar to shortly sheathing, usually persistent stipules; terminal or axillary, bracteate inflorescences with the flowers borne in one or more hemispherical to subglobose heads; bisexual, usually distylous, small to medium-sized flowers; a truncate to sinuate calyx limb; salverform white corollas with four to seven valvate

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lobes; a 2- or 4-locular ovary with two axile ovules in each locule of a 2-locular ovary or solitary ovules in each locule of a 4-locular ovary; and fleshy drupaceous fruits with two or four unilocular pyrenes. These genera together include about 90 species of low shrubs to large trees and some woody climbers found in both the New and Old World tropics.

Morinda and *Appunia* are distinguished primarily by the arrangement of their flowers, with those of each inflorescence all fused at the ovary portion and producing a single multiple fruit in *Morinda*, versus the flowers free with each producing a free drupe in *Appunia*. Additionally, these genera have sometimes been separated by their stigmas, two and linear in *Morinda* versus one and clavate in *Appunia*. Steyermark (1972: 384–385) reviewed these genera and noted that paired stigmas are also found in several species with free fruits (e.g., *A. triphylla* Ducke) and that several species have fruits that are "coherent only in their basal half" (e.g., *M. hoffmannioides* Standl.), which he considered to be a condition intermediate between the two genera. Accordingly, Steyermark concluded that the characters used to separate *Appunia* and *Morinda* were continuously variable and not consistently correlated, and he formally synonymized these genera. This conclusion has been followed by most subsequent authors (e.g., Taylor & Pool, 1993; Taylor, 1999; Boom & Delprete, 2002; Taylor et al., 2004). However, this synonymization has not been accepted by some (e.g., Taylor, 2001; Lorence et al., in prep.), who considered the free versus fused flowers and single versus multiple fruits to be clear consistent differences separating these groups and, in contrast to Steyermark, have not observed any species to be intermediate in this feature. The individual fruits of *M. hoffmannioides*, described as "partially fused" or "partially coherent" by Steyermark, appear in our observation to be shortly fused at their bases and to fall (i.e., disperse) as a single unit, although presumably these fruits are eaten by birds and sometimes individual pieces corresponding to the fruit of an individual flower may be pulled off the group. The variation in stigma form has not been carefully re-surveyed, but as shown by Steyermark this character is not correlated with fruit type. Stigma form is variable within other Rubiaceae genera (e.g., *Spermacoce* L.), and therefore does not necessarily seem taxonomically informative for either synonymization or separation of these genera.

Additionally *Bellynkxia* Müll. Arg. was separated from *Appunia* by its solitary ovules distributed in four ovary locules and its four styles. However, Bremekamp (1934) noted this observation was not correct because the ovary of *B. angulata* Müll. Arg., the type species, actually has two locules with two ovules in each. Bremekamp, however, did recognize *Bellynkxia* as a Neotropical genus of four species distinguished by its unusual inflorescence arrangement, with the leaves in a "false whorl" of three and the inflorescence "extra-axillary" (1934: 276). This arrangement is produced when the terminal inflorescence is subtended by two nodes that are not separated by an internode, with a pair of leaves developing from one node and only one leaf developing from the other, and often with one axillary bud developing to produce a sympodial continuation of the stem and an apparent lateral displacement of the inflorescence. A similar arrangement is found in several other genera of Rubiaceae (e.g., *Duperrea* Pierre ex Pit., *Brachytome* Hook. f.), and, as noted by Bremekamp, this arrangement is also found in some species of *Morinda*. *Bellynkxia* has been considered a synonym of *Morinda* by Steyermark (1967) and subsequent authors (e.g., Taylor et al., 2004).

No published molecular studies have addressed the relationships of these genera. One species of *Appunia* (*A. guatemalensis* Donn. Sm.) and one species of *Morinda* (*M. citrifolia* L.) were included by Bremer and Manen (2000) in their survey of the Rubioideae, comprising a very limited sample. Their analyses showed these two species to be closely related but did not find that they form a clearly monophyletic group, and one of their analyses found *Morinda* to be more closely related to *Caelospermum* Blume than to *Appunia*. *Caelospermum* comprises about 15 species of southeastern Asian and Pacific shrubs and small trees with free, usually pedicellate flowers (Johanssen, 1988).

Therefore, based on the morphological distinctness of these groups in the Neotropics, the lack of strong molecular evidence that *Morinda* and *Appunia* are closely related, and the suggestion from this molecular evidence that the situation may be more complicated than has been recognized, *Appunia* is here provisionally recognized as a separate genus pending pantropical study of this group and the following new species is described in *Appunia*. This new species was discovered during study of the Rubiaceae collections from South America; it is unique in *Appunia* (and also Neotropical *Morinda*) in its lianescent habit and relatively large flowers.

1. **Appunia megalantha** C. M. Taylor & Lorence, sp. nov. TYPE: Peru. Amazonas: Prov. Bagua, Dtto. Imaza, comunidad de Yamayakat, 5°03′S, 78°20′W, 600 m, 9 June 1997, *R. Vásquez, A. Peña & E. Chávez 23940* (holotype, USM; isotypes, ETSU, MO). Figure 1.

Haec species a congeneris habitu lianescente atque corolla sat grandi 6-loba distinguitur.

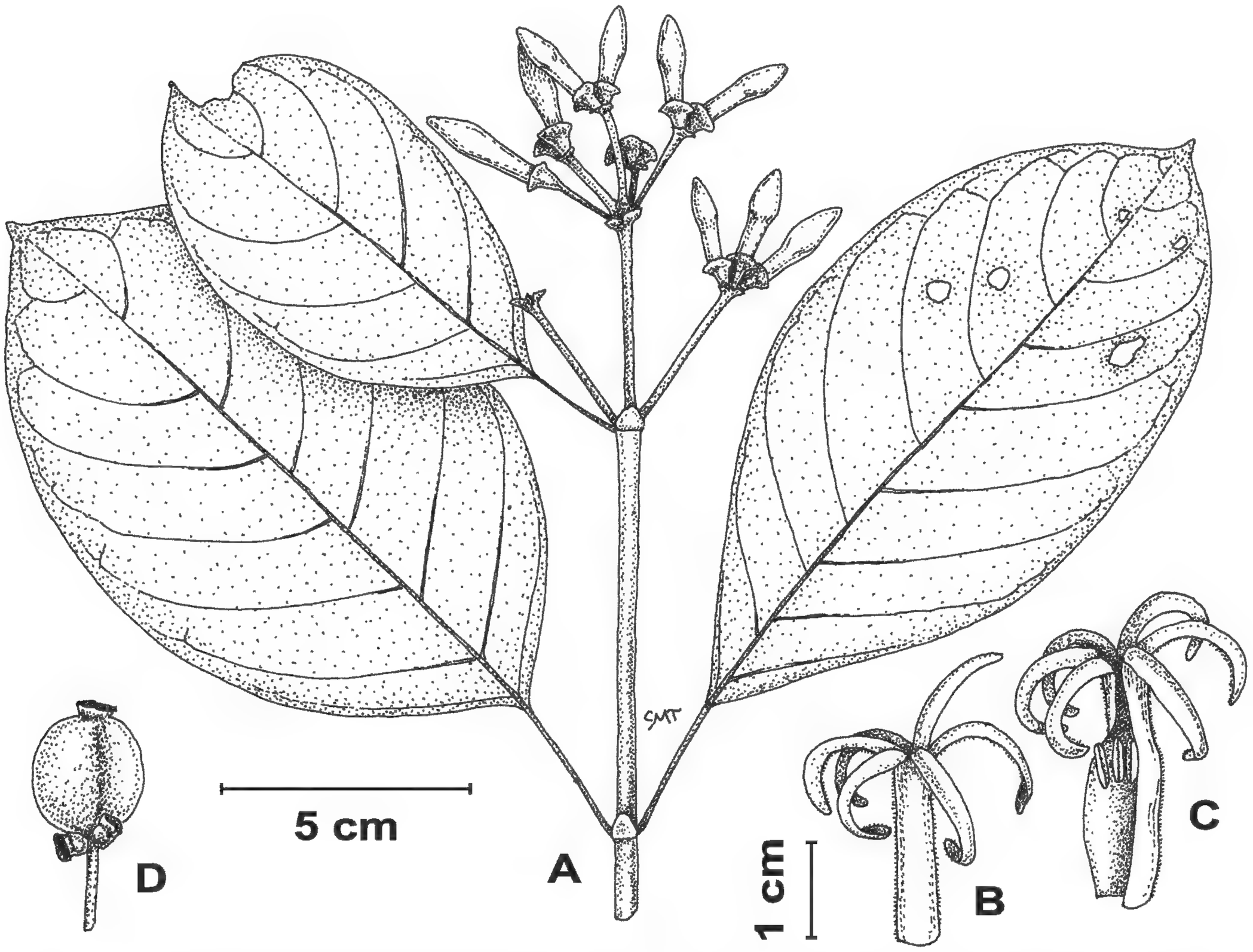

Figure 1. *Appunia megalantha* C. M. Taylor & Lorence. —A. Flowering stem. —B. Corolla at anthesis. —C. Corolla at anthesis, partially dissected. —D. Immature fruit. A–C based on *Vásquez et al. 23950* (MO); D based on *Jaramillo et al. 957* (MO); B–D to same 1-cm scale.

Climbing plants, height not noted; stems glabrous. *Leaves* elliptic, 12–15 × 5.5–8.5 cm, apex obtuse to shortly acuminate with the tip to 3 mm long, base cuneate to acute, drying papyraceous to chartaceous and sometimes discolorous, adaxially and abaxially glabrous; secondary veins in 5 to 8 pairs, at least most of them looping to interconnect, in abaxial axils with well-developed pilosulose domatia, adaxially costa and secondary veins plane to prominulous and tertiary venation plane to slenderly sulcate, abaxially costa prominulous to prominent, secondary veins prominulous, and remaining venation visible but plane; *petioles* 20–40 mm, glabrous or sometimes puberulent adaxially at least in 2 lines that connect to base of leaf bade; *stipules* persistent, interpetiolar, ovate to broadly ovate, 4–7 mm, acute or obtuse to broadly rounded, glabrous except with margins densely ciliolate. *Inflorescences* terminal and in uppermost leaf axils, paniculate, puberulent to glabrescent; peduncle 1(3), 20–70 mm; branched portion 8–12 × 8–10 cm, with secondary axes 4 to 6 per node, produced at 1 or 2 nodes, each terminating in (1)3 flowers; bracts ovate to triangular, 1–5 mm, acute to obtuse, densely puberulent to glabrous, with margins densely ciliolate. *Flowers* sessile, free; hypanthium ellipsoid, 2–2.5 mm, densely puberulent; *calyx* limb 2.5–3 mm, funnelform, truncate to irregularly denticulate, with margins densely ciliolate; *corolla* salverform, white, fleshy, externally densely puberulent, internally glabrous, tube 23–24 mm, ca. 3 mm diam. near middle, lobes 6, narrowly triangular, 15–17 mm, apparently triangular in cross section, rounded at apex, abaxially smooth; *anthers* 6, subsessile, narrowly lanceolate, ca. 5 mm, positioned just above middle of corolla tube, without apical appendage; style and stigmas not seen. Immature *fruit* ellipsoid, to 20 × 22 mm, glabrescent, mature color unknown; pyrenes 4, flattened-hemispherical to somewhat discoid, hard.

Distribution, habitat, and phenology. *Appunia megalantha* is known from northwestern Colombia and northern Peru in wet forests at 320–850 m and is presumably present in Ecuador as well. It has been collected in flower in June and in immature but well-developed fruit in January.

IUCN Red List category. This new species is documented so far by four collections from widely

separate localities that are not well known botanically; the occurrence of this species in intermediate sites is expected but currently unknown. If this new species is found in several intermediate regions it can be considered widespread and well established, but if it is confined to the known localities then its population viability may be of concern. Because these considerations counter each other, this species is here considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. This new species differs from all other species of *Appunia* in its lianescent habit, relatively large fleshy corollas with six lobes, and relatively large fruits; the other species of *Appunia* have fruits generally 6–12 mm long. The specific epithet refers to these relatively large flowers. The discovery of this species increases the number of corolla lobes known in *Appunia*, previously recorded to be four or five.

Paratypes. COLOMBIA. **Antioquia:** Mpio. San Luis, vereda San Pablo, quebrada Carbonera, Finca Aquelarre, 3°N, 75°06′W, *R. Fonnegra & W. Rengifo M. 4876* (HUA, MO). PERU. **Amazonas:** Prov. Bagua, Dtto. Imaza, Yamayakat, 4°55′S, 78°19′W, *N. Jaramillo, M. Jaramillo & E. Dekentai 957* (MO), 5°03′S, 78°20′W, *R. Vásquez, P. Stearn, R. Rojas & R. Aguilar 21612* (MO).

Coutarea

Ochoterena (1994) studied the circumscription, characters, and relationships of this Neotropical genus and recognized three species of shrubs and small trees found in evergreen, seasonal, and dry forests from Mexico and the Lesser Antilles to Uruguay and northern Argentina. Among Neotropical Rubiaceae with septicidal capsular fruits and winged seeds, *Coutarea* Aubl. can be recognized by its lack of raphides; opposite leaves; generally persistent triangular stipules; terminal, few-flowered, cymose, bracteate inflorescences; 5- to 7-merous flowers; calyx limbs lobed nearly to the base, with narrow lobes that are usually persistent on the fruits; tubular to broadly funnelform, actinomorphic to zygomorphic, white to pink, purple, or red corollas with the lobes imbricate in bud; stamens inserted near the base of the corolla and arranged all together on one side of it, through twisting by the filaments; axile placentation; woody capsules that are generally elliptic to orbicular in outline, strongly flattened perpendicular to the septum, and septicidal from the apex; and numerous, flattened, generally orbicular seeds with a concentric marginal wing. *Coutarea* belongs to a group of genera whose relationships are poorly understood; in recent studies this group has been called the "Catesbaeeae–Chiococceae–*Exostema* complex," or "CCE complex" (Robbrecht & Manen, 2006: 116).

Two species of *Coutarea* have been reported from the central Andean region of Ecuador and Peru, *C. hexandra* (Jacq.) K. Schum. and *C. andrei* Standl. (Taylor & Pool, 1993; Taylor, 1999). Two additional new species from this region are described here, both of which have previously been confused with *C. andrei*. These new species have a similar distinctive growth form, with well-developed main stems that bear paired lateral short-shoots (i.e., brachyblasts). These short-shoots bear most or all of the leaves and inflorescences; a similar growth pattern is found in some other Rubiaceae genera that characteristically grow in dry and seasonal vegetation (e.g., *Randia* L.). One of these new *Coutarea* species has tubular, bright red flowers and is apparently hummingbird pollinated, while the other has broadly funnelform, white to pale flowers and is presumably lepidopteran pollinated; both of these pollination syndromes were previously known in *Coutarea* (Ochoterena, 1994). The addition of these new species expands the morphological diversity known in *Coutarea*, puts the species with the supposedly characteristic zygomorphic corollas now in the minority, and establishes its center of diversity in South America, with one widespread species ranging from there into Mexico. In contrast to most Neotropical Rubiaceae genera, *Coutarea* is found in seasonal and dry vegetation and, with the addition of these new species, shows good representation in this vegetation in the central Andes. A revised key to all of its known species is presented below.

Coutarea andrei, *C. coutaportloides* C. M. Taylor, and *C. fuchsioides* C. M. Taylor can be confused with *Exostema corymbosum* (Ruiz & Pav.) Spreng., a shrub with a similar general aspect and very similar capsules and seeds. *Exostema corymbosum* is found in dry vegetation at 2000–2500 m in central Peru, and can be separated from these three *Coutarea* species by its lack of short-shoots, its entire stipules, and its hypocrateriform corollas that are similar in size and color to those of *C. coutaportloides* but differ in their five narrowly ligulate lobes that are equal to or a little longer than the narrowly cylindrical tube.

Key to Species of *Coutarea* in Mexico, Central America, and South America

1a. Corollas zygomorphic, curved in the tube, white to pink, with tube funnelform, 19–60 mm long; anthers exserted.
  2a. Fruit reddish brown, with lenticels well developed, numerous, and circular; dry forests in Venezuela, Brazil, Bolivia, Paraguay, and Argentina at 120–900 m . . . . . *C. alba* Griseb.
  2b. Fruit gray to brown or black, without lenticels or these few to numerous and elliptic; wet to seasonal forests from Mexico to Argentina at 0–1400 m . . . . . *C. hexandra*

1b. Corollas actinomorphic, straight in tube, pink to red, tubular to funnelform or a little inflated, 16–20 mm long; anthers partly to completely included.
  3a. Corolla funnelform, white to pink, with tube 12–16 mm wide at mouth (on dried specimens) . . . . . *C. coutaportloides*
  3b. Corolla tubular to tubular-funnelform or a little inflated, red, with tube 3–7 mm wide at mouth (on dried specimens).
    4a. Corolla tubular-funnelform to a little inflated, with tube 4–7 mm wide at mouth (on dried specimens); calyx lobes 5 . . . . . *C. andrei*
    4b. Corolla tubular, with tube 3–4 mm wide at mouth (on dried specimens); calyx lobes 7 . . . . . *C. fuchsioides*

1. Coutarea coutaportloides C. M. Taylor, sp. nov. TYPE: Ecuador. Azuay: rd. from Oña to Cochapata, Km 20.3, 3°25′S, 79°06′W, 2500 m, 24 Oct. 1997, *G. P. Lewis & P. Lozano 3650* (holotype, QCNE; isotypes, K, MO 5564858). Figure 2B, C.

Haec species a congeneris floribus fructibusque plerumque a brachyblastis lateralibus productis atque corolla actinomorpha infundibuliformi alba vel pallide rosea tubo 18–20 mm longa distinguitur.

Shrubs flowering at 2–4 m tall; stems flattened to terete, puberulent to glabrescent; lateral short-shoots 0.5–6 cm. *Leaves* subsessile to petiolate, with petioles to 4 mm; blades elliptic to ovate, 15–50 × 6–22 mm, base cuneate to rounded, apex obtuse to acute, drying chartaceous to subcoriaceous, glabrous; secondary veins in 3 to 5 pairs, without domatia, tertiary venation visible abaxially and reticulated or often with some free vein endings; stipules persistent, interpetiolar, triangular, 2–4 mm, puberulent to glabrescent, obtuse to acute, entire or usually glandular-fimbriate with 2 to 6 glands, these 0.1–0.3 mm. *Flowers* 1 to 3 and fasciculate or cymose at stem apices and also sometimes in uppermost leaf axils; peduncles and/or pedicels 1.5–5 mm, puberulent; bracts linear to lanceolate or foliaceous, 1–4 mm, sometimes with glandular margins; ovary narrowly ellipsoid, 3–4 mm, glabrous; calyx limb divided essentially to base, lobes 6, narrowly triangular, 4–5 mm, externally glabrous, internally densely pilosulose, acute; corolla funnelform, pale pink externally, white internally, glabrous throughout, tube 18–20 mm, 12–16 mm wide at mouth (on dried specimens), lobes 6, ovate, 5–7 mm, obtuse; anthers 5, narrowly oblong, ca. 7 mm, with tips exserted for 1–2 mm, filaments inserted at base of corolla, glabrous except pilosulose in lower 1/2; stigmas cylindrical, ca. 3 mm, positioned with anthers, style glabrous, flattened and 2-winged. *Fruits* ellipsoid-oblong, 15–20 × 10–13 mm, strongly flattened, glabrous, with several to numerous prominent round lenticels, with peduncles or stipes apparently elongating as fruit develops, to 15 mm; seeds flattened, suborbicular, 6–8 mm, glabrous.

Distribution, habitat, and phenology. Coutarea coutaportloides is known from seasonal to dry disturbed forests and scrub vegetation at 2450–2550 m in southwestern Ecuador. It has been collected with flowers in October and November, and with fruits in April.

IUCN Red List category. This new species is documented so far by three collections from separate localities in the dry and seasonal forests of southwestern Ecuador, which are not well known botanically; the occurrence of this species in intermediate sites is expected but currently unknown. If this new species is found in additional sites it could be considered relatively widespread and well established, but if it is confined to only the known localities, then its population viability may be of concern. Because these considerations counter each other, this species is here considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. Coutarea coutaportloides is distinguished within this genus by its leaves and flowers borne mostly on lateral short-shoots, its rather small leaves (so far as known), and its funnelform, actinomorphic, white to pale pink corollas with the tubes 18–20 mm long. In general aspect and in particular in the size and shape of the corollas, *C. coutaportloides* resembles species of *Coutaportla* Urb. from Mexico and Central America; the specific epithet refers to this similarity. *Coutaportla* is closely related to *Coutarea*, but differs in having two to five ovules per locule and seeds that are unwinged and have a thickened margin, versus 11 to 50 ovules per locule and seeds with thin, well-developed, concentric wings in *Coutarea*.

This new species appears to be deciduous and to produce the flowers together with the new leaves, so conclusively grouping flowering and fruiting specimens is problematic until more specimens are available. The description here of vegetative structures is based primarily on the fruiting paratype collection from El Oro, which has mature leaves and is provisionally included here. These two specimens share glandular-fimbriate stipules and calyx lobes that are pubescent on the adaxial surface; however, occasional sparsely glandular-fimbriate stipules and puberulent to ciliolate-margined calyx lobes are found on some specimens of *Coutarea andrei*, which is found in areas relatively near to *C. coutaportloides*.

Paratypes. ECUADOR. **El Oro:** Guanazán, Los 7 Llanos, *X. Cornejo & C. Bonifaz 6090* (GUAY, MO). **Loja:**

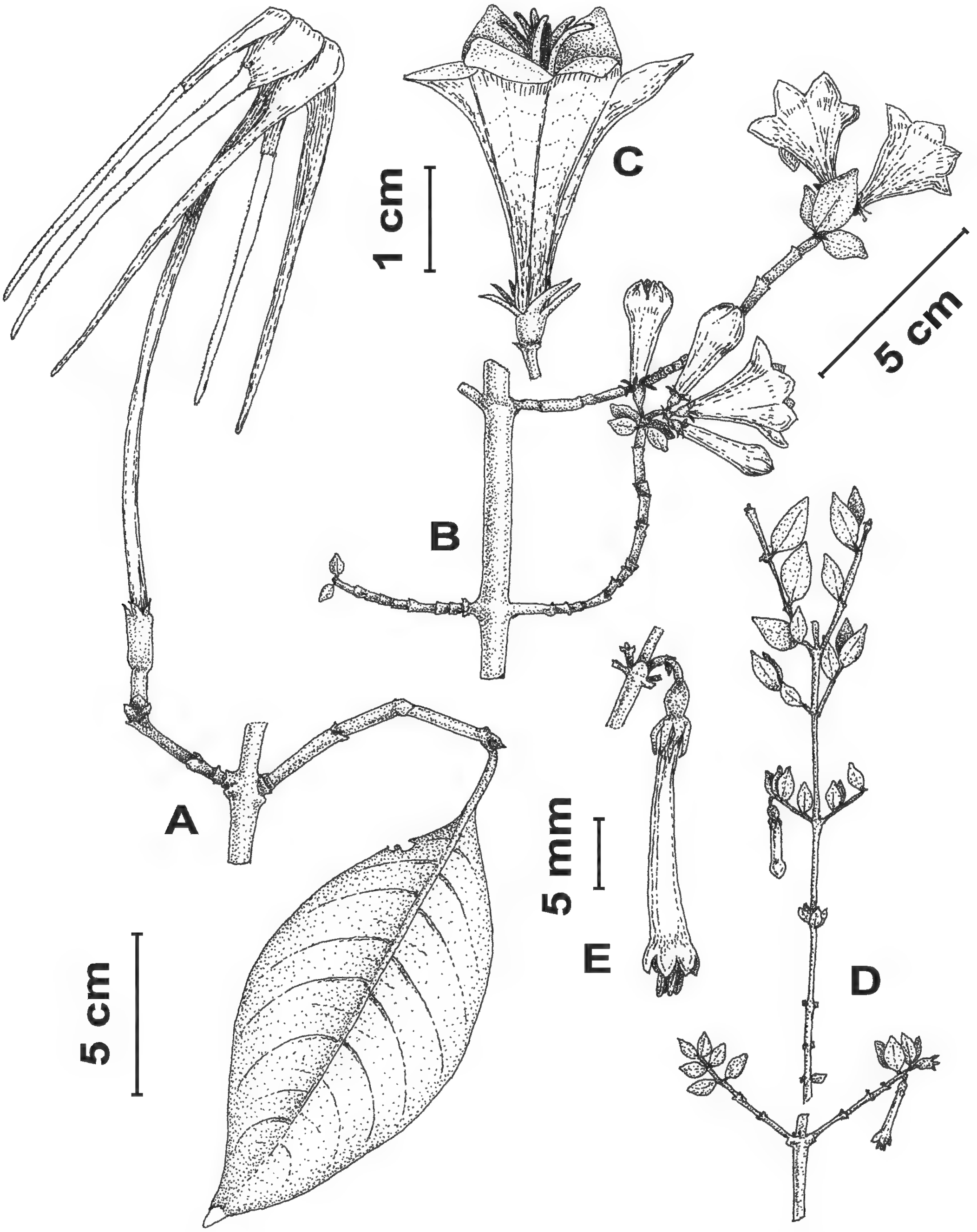

Figure 2. A. *Rosenbergiodendron reflexum* C. M. Taylor & Lorence. —A. Flowering stem; specimen has incomplete flower and leaf, missing parts are interpolated in unshaded areas. B, C. *Coutarea coutaportloides* C. M. Taylor. —B. Flowering stem. —C. Flower and portion of pedicel. D, E. *Coutarea fuchsioides* C. M. Taylor. —D. Flowering stem. —E. Flower, pedicel, and portion of stem with one node and leaf. A based on *Gentry 43707* (MO); B, C based on *Lewis et al. 3683* (K); D, E based on *Jara 55* (MO); B, D to same 5-cm scale.

Saraguro–Celeh, Km 18, *G. P. Lewis, B. Merino & N. Aguirre 3683* (K).

2. Coutarea fuchsioides C. M. Taylor, sp. nov. TYPE: Peru. La Libertad: Prov. Pataz, rd. (Huamachuco to) Chagual–Pataz, after Chagual, 7°49′S, 77°38′W, 1799 m, 21 Apr. 2004, *M. Weigand & C. Schwarzer 7917* (holotype, USM; isotypes, BSB not seen, MO). Figure 2D, E.

Haec species a congeneris foliis floribusque plerumque a brachyblastis lateralibus productis atque corolla rubra actinomorpha anguste tubulari distinguitur.

Shrubs flowering at 1.5–3 m tall; stems subterete, glabrous; lateral short-shoots 0.5–6 cm, sometimes spinescent. *Leaves* subsessile to petiolate, with petioles to 1 mm; blade elliptic to lanceolate or elliptic-ovate, 7–25 × 5–16 mm, base rounded to truncate or cordulate, apex obtuse, drying chartaceous, adaxially glabrous and shiny, abaxially puberulent to glabrescent; secondary veins in 2 to 5 pairs, sometimes with pilosulose domatia, tertiary venation mostly not visible; *stipules* persistent, shortly fused around stem, broadly triangular, 1–3 mm, puberulent to glabrescent, obtuse, entire. *Flowers* solitary, deflexed to pendulous, terminal or axillary; peduncles 3–7 mm, puberulent, with 1 to 3 articulations bearing reduced stipules and bracts or reduced leaves; bracts linear to elliptic, 1.5–6 mm; ovary narrowly elliptic to obovoid, 3–4 mm, puberulent; calyx limb divided essentially to base, puberulent to glabrescent, lobes 7, narrowly triangular to spatulate, 2–4.5 mm, equal to subequal, acute; corolla tubular, externally glabrous, internally glabrous except puberulent in basal 1/3, tube 16–18 mm, 3–4 mm wide at mouth (on dried specimens), lobes 6, ovate to elliptic-ovate, ca. 2 mm, obtuse to rounded; anthers 5, narrowly oblong, ca. 7 mm, with 1–2 mm of tips exserted, with filaments flexuous, inserted at base of corolla, glabrous except puberulent in basal 1/3; stigmas slenderly cylindrical, ca. 5 mm, twisted, with 2 longitudinal grooves, positioned with anthers, with style glabrous. *Immature* fruit obovate in outline, to ca. 6 × 7 mm, glabrous, with stipe or peduncle perhaps elongating during development.

Distribution, habitat, and phenology. *Coutarea fuchsioides* is known from dry scrub forest at 2000–2800 m in northeastern Peru, growing at least sometimes on limestone substrates. It has been collected with flowers in January and April.

IUCN Red List category. This species is documented so far by two collections from separate localities in the dry and seasonal forests of northern Peru, which are not well known botanically; the occurrence of this species in intermediate sites is expected, but currently unknown. If this new species is found in additional sites it could be considered relatively widespread and well established, but if it is confined to only the known localities, then its population viability may be of concern. Because these considerations counter each other, this species is here considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. *Coutarea fuchsioides* is distinguished within this genus by its leaves and flowers borne mostly on lateral short-shoots; its rather small leaves (so far as known); its flowers borne singly, variously terminal and axillary, and usually pendulous; and its narrowly tubular red corollas. This species is provisionally classified in *Coutarea* until mature fruits and seeds are available to evaluate this. Its immature fruits are only a little flattened, but this is characteristic of the immature fruits seen on many *Coutarea* specimens of several species, which appear to develop their characteristic lateral compression late in development. In flower shape, color, and orientation this new species is similar to some species of *Fuchsia* L. (Onagraceae); the specific epithet refers to this similarity. Several of the corollas have a longitudinal slit in the basal half, presumably made by flower-piercing birds robbing nectar.

Paratype. PERU. **Ancash:** Prov. Antonio Raimondi, Ranraucru–Chingas, 2800 m, 3 Jan. 2005, *E. Jara 55* (MO, USM).

Patima

Delprete et al. (2005) studied this poorly known genus of low shrubs found in wet forests in the Guianas and concluded that the genus is monotypic and best placed in the Neotropical tribe Hamelieae. *Patima* Aubl. is characterized by its little-branched habit; opposite leaves with interpetiolar triangular stipules that often persist with the leaves; few-flowered axillary inflorescences; flowers with a well-developed subglobose hypanthium and truncate calyx limb; salverform yellow to pale green corollas with five to seven ovate, valvate lobes; 5- or 6-locular ovaries with numerous ovules; and subglobose baccate fruits. Delprete et al. noted for the first time the presence of raphides in *Patima*, as well as their limited distribution within the tissues of the plant. Their placement of this genus in Hamelieae expanded the morphology of the tribe to include valvate corolla lobes, which had not previously been reported (Lorence & Dwyer, 1988; Delprete, 1998). However, the corolla lobe arrangement of *P. guianensis* Aubl. could also be considered as valvate-reduplicate (Taylor, pers. obs.). Delprete et al. described the inflorescences as "supranodal, sessile, fasciculate" (2005: 109), but they appear to be placed directly in

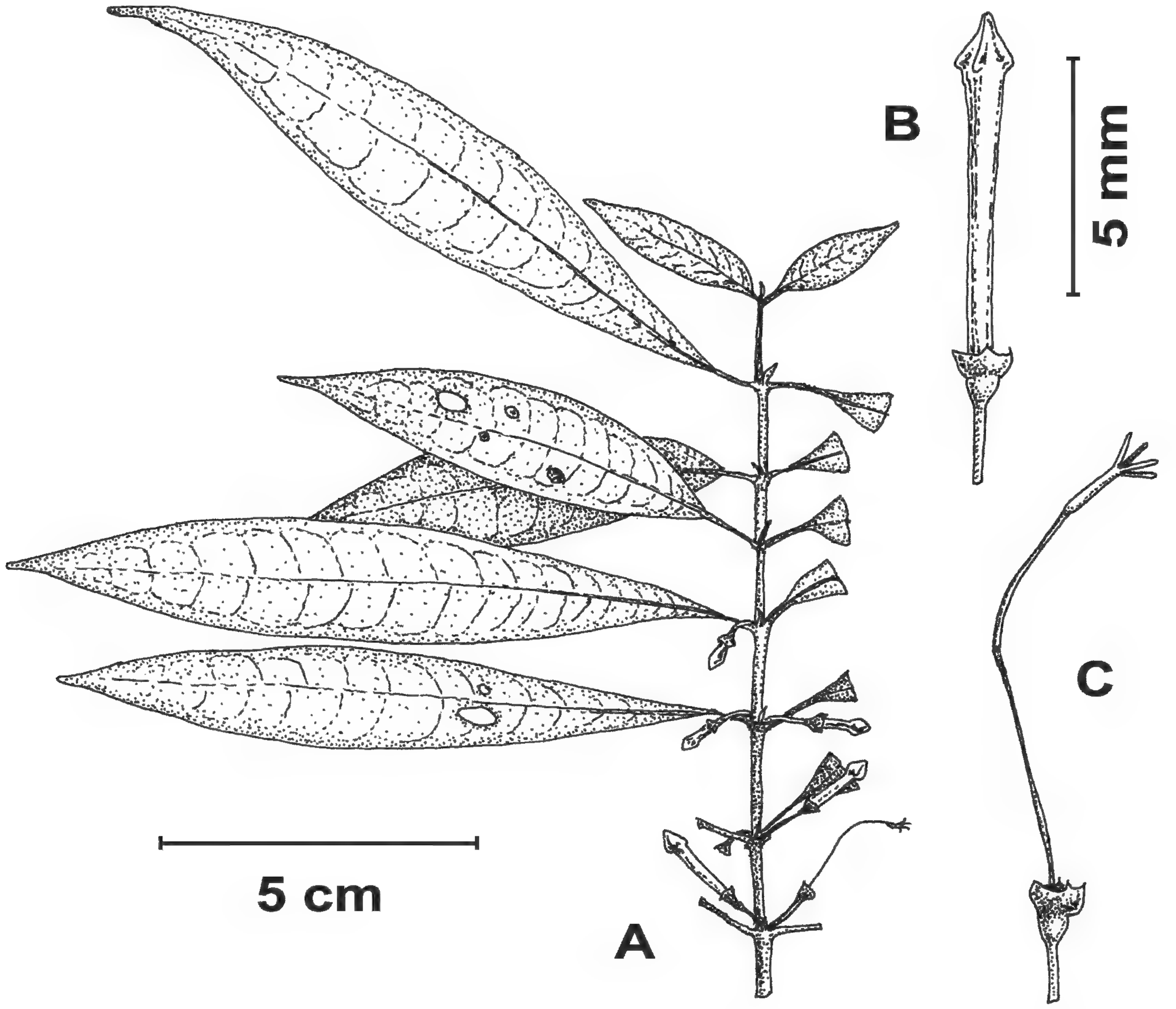

Figure 3. *Patima minor* C. M. Taylor. —A. Flowering stem. —B. Flower bud with portion of pedicel. —C. Portion of dissected flower, showing pedicel, calyx limb, style, and stigmas. Based on *Henkel et al. 4355* (MO); B, C to same 5-mm scale.

the leaf axil on at least some specimens of *P. guianensis* (e.g., *McDowell & Gopaul 3622A*, MO; *de Granville et al. 5829*, MO) and to sometimes be cymose with reduced axes (e.g., *de Granville et al. 5829*, MO). The inflorescences are bracteate, although the bracts are usually reduced.

Several recent collections from Guyana represent a second species of *Patima*, described below, and thus double the number of species in this genus. This new species has four stigmas and apparently sometimes four calyx teeth, and increases the known range of number of flower parts in *Patima*. This new species is found in the same region as *P. guianensis* and can be distinguished from *P. guianensis* as outlined in the key below.

Key to Species of *Patima* in the Guianas

1a. Stems of flowering branches stout, 3–6 mm diam., somewhat succulent, markedly hollow; petioles 55–130 mm long; leaf blades 18–53 × 7.5–22 cm; calyx limb 2–3 mm long; plants of lower elevations, 80–760 m . . . . . *P. guianensis*

1b. Stems of flowering branches slender, 2–3 mm diam., hardly succulent, solid or mostly solid; petioles 8–20 mm long; leaf blades 7–13 × 1.5–2.2 cm; calyx limb 1–1.1 mm long; plants of middle elevations, 975–1450 m . . . . . *P. minor* C. M. Taylor

1. Patima minor C. M. Taylor, sp. nov. TYPE: Guyana. Potaro-Siparuni: Pakaraima Mtns., Mt. Wokomung, toe slope 0.5–2 km NW from N escarpment, 5°04′N, 59°53′W, 1300–1400 m, 13 Nov. 1993, *T. W. Henkel, R. Williams, S. Fratello & L. Williams 4355* (holotype, MO 5000774; isotype, US not seen). Figure 3.

Haec species a *Patima guianensi* Aubl. statura foliisque minoribus atque limbo calycino breviore distinguitur.

Shrubs to 3 m tall; flowering stems 2–3 mm diam., moderately to densely strigillose. *Leaves* opposite;

blade narrowly oblanceolate to narrowly elliptic, 7–13 × 1.5–2.2 cm, drying papyraceous to chartaceous, adaxially sparsely strigillose to strigose, abaxially puberulent to strigillose and perhaps paler when alive, base acute, apex acute and sometimes rather falcate; secondary veins in 12 to 13 pairs, usually looping to interconnect near margins; *petioles* 8–20 mm, hirtellous; *stipules* interpetiolar, narrowly triangular to acicular, 4–5.5 mm, strigillose, persisting on upper nodes but deciduous before leaves fall. *Flowers* solitary in each axil; peduncles 6–12 mm, strigillose; bracts triangular, 0.5–1 mm; hypanthium portion turbinate, 1–1.3 mm, puberulent to hirtellous; *calyx* limb 1–1.1 mm, puberulent, 4- to 5-denticulate; *corolla* in bud salverform, greenish yellow, glabrous internally and externally, tube to 18 mm, lobes 4, ovate, to 2 mm, acuminate to aristate at apex; stamens in bud to 2 mm; style ca. 20 mm; stigmas 4, linear, ca. 2 mm. Young *fruit* subglobose to ovoid, 3–3.5 mm diam., strigillose; *seeds* ca. 0.5 mm diam.

Distribution, habitat, and phenology. *Patima minor* is known from cloud forest on sandstone substrates at 975–1450 m in the Pakaraima Mountains of western Guyana. It has been collected with flowers in February and November, and with young fruits in July.

IUCN Red List category. This new species is documented so far by several collections from separate localities in the mountains of western Guyana, which are not well known botanically. This species may be rare in its range, but it is a plant of low stature and may have been overlooked. Because no more conclusive information is available, this species is here considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. This new species can be separated from *Patima guianensis* by its much smaller leaves and shorter calyx limb; the specific epithet refers to this difference. All the corollas seen are in bud, but the type specimen also has an apparently mature style that has persisted after the corolla fell off. Delprete et al. (2005) noted that the stigmas of *P. guianensis* are situated in the corolla throat; if the stigma position is similar in *P. minor*, then the corolla tube can be inferred to be ca. 20 mm long and the flower buds seen are nearly mature. In this case, the two species of *Patima* also apparently differ in corolla lobe length, ca. 20 mm long or perhaps a bit longer in *P. minor* versus 5.5–6.5 mm long in *P. guianensis*.

Paratypes. GUYANA. **Potaro-Siparuni:** Pakaraima Mtns., Mt. Wokomung, upslope to NE 1–2 km from headwaters of Wusupubaru Creek, 5°03′N, 59°53′W, 975–1125 m, 16 Feb. 1993, *T. W. Henkel, M. Chin & W. Ryan 4355* (MO, US); 1.5 km NE of Mt. Wokomung, slopes above second of four escarpments, 5°48′N, 59°51′W, 1450 m, 7 July 2003, *H. D. Clark, R. Williams, C. Perry, E. Tripp, J. Kelly, D. Gittens & S. Stern 10638* (MO, US).

Rosenbergiodendron

Gustafsson (1998) nicely clarified the delimitation and characters of this Neotropical genus, and recognized three species of unarmed shrubs and small trees found in both evergreen and seasonal forest from southern Central America to central South America. *Rosenbergiodendron* Fagerl. has sometimes been combined or confused with *Randia* and several other genera of the tribe Gardenieae. These all share opposite decussate leaves; generally well-developed, persistent, triangular stipules; white, often nocturnal flowers, with usually well-developed tubular calyx limbs that persist on the fruits; hypocrateriform corollas with lobes that are convolute in bud; and relatively large, fleshy, indehiscent fruits with numerous seeds embedded in a gelatinous pulp. *Rosenbergiodendron* can be distinguished by the combination of its lack of spines, bisexual 5-merous flowers borne singly on terminal and pseudoaxillary (i.e., lateral) short-shoots, pollen in monads, parietal placentation, and immature fruits that are (so far as known) green marked with white longitudinal stripes. *Rosenbergiodendron* is similar to *Sphinctanthus* Benth.; *Sphinctanthus* (as currently circumscribed) differs in its flowers borne on developed stems, axile placentation, and immature fruits apparently uniformly green (Taylor et al., 2004). Most other Neotropical genera of Gardenieae differ in their unisexual flowers borne on dioecious plants and their staminate flowers borne in cymose groups. Generic delimitation within this tribe is complicated and not yet stable, but the separation of *Rosenbergiodendron* seems well supported (Persson, 2000).

Rosenbergiodendron is notable for its relatively large, white, nocturnal flowers. In the smallest flowers of the genus, in *R. densiflorum* (K. Schum.) Fagerl., the corolla tubes are 3–6.5 cm and the lobes 1.2–3 cm long; the largest corollas are those of *R. longiflorum* (Ruiz & Pav.) Fagerl., with the tubes 12–30 cm and the lobes 3–12 cm long (Gustafsson, 1998). There is marked variation in corolla size within an individual species of *Rosenbergiodendron*, similar to that found in some other nocturnally flowering Rubiaceae, e.g., *Hillia* Jacq. (Taylor, 1994). In previously described species of *Rosenbergiodendron*, the corolla lobes are much less than half as long as the tube; the new species described here has corolla lobes about half as long as the corolla tube. This new species will key out to *Rosenbergiodendron* in recent Neotropical floras (e.g., Taylor et al., 2004) and is provisionally

classified here pending study of additional specimens and a better understanding of this complicated tribe (e.g., Persson, 2000).

1. **Rosenbergiodendron reflexum** C. M. Taylor & Lorence, sp. nov. TYPE: Peru. Madre de Dios: Cocha Cashu Biol. Station, Manu Natl. Park, 11°52′S, 71°22′W, 400 m, 20 Aug. 1983, *A. Gentry 43707* (holotype, MO 4624983). Figure 2A.

Haec species a congeneris petiolis bene evolutis, fructu grandi subgloboso atque lobis corollinis sat longis valde reflexis distinguitur.

Small trees, flowering at 3–4.5 m tall; stems flattened to terete, glabrous; short-shoots congested to well developed, each with basalmost node 0.1–6 cm. *Leaves* opposite; blades elliptic, 12–28 × 4–12 cm, base cuneate to acute, apex acute to shortly acuminate, drying thickly papery, adaxially glabrous, abaxially glabrous or sparsely strigillose on midrib; secondary veins in 8 to 12 pairs, without domatia, adaxially venation plane or midrib a little thickened, abaxially midrib and secondary veins prominent, intersecondary and tertiary veins visible and flat to prominulous, higher-order venation not visible; *petioles* 1.5–3.2 cm; *stipules* shortly fused at base, with interpetiolar portion broadly triangular, 4–7 mm, glabrous, obtuse, with apiculate triangular tip 1–2 mm, this terminal or inserted shortly below stipule apex abaxially. *Flowers* bisexual, solitary, sessile, terminal on short-shoots, subtended by 2 or 3 pairs of leafless stipules; ovary portion cylindrical to ellipsoid, moderately to densely puberulent-strigillose, 1.2–1.5 cm; calyx limb externally puberulent-strigillose, with tube 11–13 mm, lobes 5, linear, 4–10 mm; corolla salverform, white, externally moderately to densely puberulent-strigillose, tube ca. 21 cm, 4–5 mm diam. near middle, lobes 5, narrowly triangular, ca. 13.5 cm (possibly longer, but tip broken off on specimens seen), ca. 17 mm wide near base, 1–2.5 mm wide in upper half, acute; anthers and stigmas not seen. *Fruit* ellipsoid, ca. 9 × 6 cm in life, ca. 5.5 × 4 cm when dry, smooth or with 10 narrow low longitudinal ridges, white sometimes with longitudinal green lines or ridges at maturity becoming yellow sometimes with dark yellow lines or ridges; seeds ellipsoid, flattened, 8–10 mm.

Distribution, habitat, and phenology. *Rosenbergiodendron reflexum* is known from wet forest on alluvial floodplains and nonflooded hillsides at 350–1100 m in southeastern Peru and perhaps adjacent western Brazil. It has been collected in bud and flower in July, August, and October, and in fruit in March.

IUCN Red List category. This new species is documented so far by four or perhaps five collections from separate localities in wet forests of the southwestern Amazon basin, which are not well known botanically; the occurrence of this species in intermediate sites is expected, but currently unknown. If this new species is found in additional sites, it could be considered relatively widespread and well established, but if it is confined to only the known localities, then its population viability may be of concern. This species apparently produces relatively few nocturnal flowers of probably short duration, and it may have been overlooked by some collectors. Because no more conclusive information is available, this species is here considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. *Rosenbergiodendron reflexum* is distinguished from the other species of the genus by its well-developed petioles, relatively large subglobose fruits, and relatively long corolla lobes that are strongly reflexed at anthesis. The species epithet refers to the attitude of the corolla lobes. The remaining species of *Rosenbergiodendron* have sessile or subsessile leaves or petioles up to 1 cm long, fruits that are cylindrical or subglobose and 1–2 cm long, and corolla lobes 1.2–12 cm long and spreading to somewhat reflexed. The label data of *Gentry 43703* report the "fruits striped green and orangish cream"; presumably those are young fruits in the process of ripening, but the specimen seen has only flower buds. Only one specimen, the holotype, has a nearly complete flower at anthesis; to avoid damaging it, this flower was not dissected so the anthers, stigmas, and internal corolla pubescence are not described here. The combination of white, apparently nocturnal flowers and corolla with an exceptionally long slender tube suggests pollination by hawkmoths.

Paratypes. PERU. **Cusco:** Prov. Paucartambo, Dtto. Kosñipata, Quebrada Sacharacayo, *R. Vásquez, C. Davidson, S. Davidson* [sic; *S. Christoph*], *J. Farfán, E. Suclli & A. Peña* (AMAZ, MO). **Madre de Dios:** Manu Natl. Park, Cocha Juarez, *R. B. Foster 13300* (F, MO); Cocha Cashu Biol. Station, *A. Gentry 43703* (MO); Cocha Otorongo Plot, *P. Núñez, J. Terborgh, et al.* [sic on label, other collectors not named] *14486* (MO). **Puno:** Prov. Sandia, betw. R. Azata–Colorado, *P. Núñez & C. Muñoz 5257* (MO). **Ucayali:** Prov. Coronel Portillo, Dtto. Iparía, cuanca del Río Iparía, ca. de la comunidad nativa Ashaninka de Miraflores, *J. G. Graham & J. Schunke Vigo 4506* (F, MO), *4277* (F, MO).

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A New Species and Variety of *Senecio* (Asteraceae) from Patagonian Argentina

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ABSTRACT. Two novelties in the genus *Senecio* L. sect. *Senecio* of Patagonia (Argentina) are described and illustrated: a new species, *S. breviramulus* Tortosa & Adr. Bartoli belonging to series *Xerosenecio* (Cabrera) Cabrera & S. E. Freire, and the new variety *pinohachense* Tortosa & Adr. Bartoli for *S. volckmannii* Phil. belonging to series *Suffruticosi* Cabrera subser. *Candidi* (Cabrera) Cabrera & S. E. Freire. The new species is allied to *S. covasii* Cabrera and *S. pumilus* Tortosa & Adr. Bartoli, from which it differs by the smaller, narrowly elliptic leaves and narrower heads with fewer flowers. The new variety of *S. volckmannii* differs from the typical variety by the presence of female ray florets and the pedunculate capitula.

RESUMEN. Se describen e ilustran dos novedades en el género *Senecio* L. sect. *Senecio* de Patagonia (Argentina): una nueva especie *S. breviramulus* Tortosa & Adr. Bartoli, que pertenece a la serie *Xerosenecio* (Cabrera) Cabrera & S. E. Freire, y una nueva variedad, *S. volckmannii* Phil. var. *pinohachense* Tortosa & Adr. Bartoli, de la serie *Suffruticosi* Cabrera subser. *Candidi* (Cabrera) Cabrera & S. E. Freire. La nueva especie es afín a *S. covasii* Cabrera y *S. pumilus* Tortosa & Adr. Bartoli, de las cuales se diferencia por sus hojas menores, angostamente elípticas, y sus capítulos más angostos, con menor número de flores. La nueva variedad de *S. volckmannii* se diferencia de la variedad típica por la presencia de flores liguladas femeninas y capítulos pedunculados.

Key words: Argentina, Asteraceae, IUCN Red List, Patagonia, *Senecio*.

The genus *Senecio* L. is composed of about 3000 species worldwide, with the highest diversity in mountainous and desert regions of southern South America, tropical South Africa, and central and eastern Asia (Bartoli et al., 2004).

In southern South America, the genus is represented by ca. 643 species, of which 280 were recognized by Cabrera (1949) in Chile; 90 in Brazil, Uruguay, and Paraguay (Cabrera, 1957); and 114 in Bolivia (Cabrera, 1985). In Argentina, according to Cabrera et al. (1999) *Senecio* is represented by 266 native species, arranged in three sections and 16 series. Since the publication of that paper for Argentinean species, several authors have made research contributions. In 2001, Tombesi described *S. calingastensis* Tombesi, belonging to series *Corymbosi* (Cabrera) Cabrera subser. *Brasilienses* Cabrera & S. E. Freire (Tombesi, 2001). Later, Long (2002) included *S. quequensis* Cabrera of series *Xerosenecio* (Cabrera) Cabrera & S. E. Freire subser. *Filaginoidei* (Cabrera) Cabrera & S. E. Freire in the synonymy of *S. bergii* Hieron. Subsequently, Bartoli et al. (2004) described *S. nemiae* Adr. Bartoli, Tortosa & S. E. Freire of series *Corymbosi* subser. *Adenotrichi* (Lindl.) Adr. Bartoli, Tortosa & S. E. Freire. Afterward, Tortosa and Bartoli (2005) founded two new entities, *S. fragrantissimus* Tortosa & Adr. Bartoli and *S. pumilus* Tortosa & Adr. Bartoli, both species belonging to series *Xerosenecio* subser. *Filaginoidei*. Troiani and Steibel (2006) described a new species from Patagonia, *S. chipauquilensis* Troiani & Steibel, from series *Xerosenecio* subser. *Microcephali* (Cabrera) Cabrera & S. E. Freire, and Tortosa and Bartoli included *S. rosmarinus* Phil. and *S. spegazzinii* Cabrera as synonyms of *S. volckmannii* Phil., which belongs to series *Suffruticosi* Cabrera subser. *Candidi* (Cabrera) Cabrera & S. E. Freire. Tortosa and Bartoli later resurrected *S. floccidus* Hombr. & Jacquinot of series *Xerosenecio* subser. *Filaginoidei* and concluded that *S. patagonicus* Hook. & Arn. var. *andersonii* (Hook. f.) Cabrera is

a synonym of *S. arnottii* Hook. f. (Tortosa & Bartoli, 2007). Recently, Tortosa and Bartoli (2008) have redefined *S. filaginoides* DC. and resurrected three species, *S. caricifolius* Hook. & Arn., *S. leuciscus* Phil., and *S. quenselii* Skottsb., all belonging to series *Xerosenecio* subser. *Filaginoidei*.

During the revision of *Senecio* sect. *Senecio* (Asteraceae) in Patagonia, we found a new species of series *Xerosenecio* subser. *Microcephali* and a new variety of *S. volckmannii*, which belongs to series *Suffruticosi* subser. *Candidi* (Cabrera et al., 1999). Both series are found in southern South America; series *Xerosenecio*, composed of ca. 45 species, is characterized by discoid capitula that are grouped in terminal corymbs, while in series *Suffruticosi*, with 143 species, the capitula are solitary or occasionally in groups of two to three (to five) and are discoid or with marginal filiform flowers. The presence of solitary or grouped capitula as well as radiate or discoid capitula may be variable within a single species. The overlapping of these characters raised doubts regarding the infrageneric classification proposed by Cabrera and Freire (Cabrera et al., 1999) for the austral South American species of *Senecio*. Although useful for a genus with such a large number of species, this artificial classification does not reflect the phylogenetic relationships of the species; this was demonstrated by Tortosa and Bartoli (2006), who transferred to the synonymy of *S. volckmannii* two species with solitary heads, *S. rosmarinus* and *S. spegazzinii*, which were previously included by Cabrera et al. (1999) in series *Xerosenecio* subser. *Filaginoidei*.

New Species for *Senecio* ser. *Xerosenecio*

1. Senecio breviramulus Tortosa & Adr. Bartoli, sp. nov. TYPE: Argentina. Neuquén: Minas, Las Ovejas, camino a Las Lagunas, Mallín Quemado, 37°01′S, 70°45′W, 2 Feb. 1982, *C. P. Movia s.n.* (holotype, BAA 17904). Figure 1.

Inter species *Senecionis* seriei *Xerosenecionis* (Cabrera) Cabrera & S. E. Freire ramulis brevibus foliis ad basem confertis sursum laxis ad *S. covasii* Cabrera et *S. pumilum* Tortosa & Adr. Bartoli accedens, sed foliis anguste ellipticis minoribus et capitulis angustioribus pauci- (12- ad 14-) floris ab eis recedens.

Dwarf shrubs, 12–15 cm tall, much branched at the base; stems woody, prostrate, giving rise at their nodes to tender, herbaceous, ascending shoots, lanuginose, with leaves congested at shoot bases, 0.6–1 mm diam.; flowering shoots arising from leafy shoots, with scattered leaves. Leaves alternate, sessile, linear to narrowly elliptic, spatulate, rounded or slightly acute at the apex, 0.8–1.2 cm × 0.8–1.2 mm, margin involute, entire or with 1 or 2 teeth per side, densely glaucous and lanuginose on both surfaces. Capitulescence at the end of leafy shoots, with 6 to 11 capitula; peduncles 0.3–2 cm. Capitula discoid, 12- to 14-flowered; involucre calyculate, narrowly obconic, ca. 5 × 2.5 mm; calycular bracts ca. 5, elliptic, 1–1.5 mm, lanuginose; phyllaries 8 or 9, dorsally lanuginose, acuminate, apex dark. Disk florets hermaphroditic; corolla yellow, tubular, glabrous, 5–6 mm, lobes triangular, ca. 0.7 mm long, ca. 0.5 mm wide at base; anthers minutely tailed, 2–2.5 mm; filament collars spatulate, ca. 0.45 mm; apical anther appendages deltoid, ca. 0.25 mm; the basal tails ca. 0.1 mm; style branches ca. 1.2 mm. Cypselae cylindric, glabrous, ca. 3.5 mm, ribbed; pappus bristles many, slender, barbellate, ca. 5.5 mm, whitish cream.

Distribution and habitat. *Senecio breviramulus* has been found in the mountains in the north of Neuquén Province, Argentina, at elevations of 1700–1800 m. This species grows on dry sandy soil with rocky outcrops in rather scattered populations and is associated with species of *Festuca* L., *Stipa* L., *Poa* L., *Mulinum* Pers., and *Chuquiraga* Juss.

IUCN Red List category. Due to the reduced population size, very restricted area of occupancy, and lack of data on changes in population size, this species should be considered Critically Endangered (CR) according to IUCN Red list criteria (IUCN, 2001).

Etymology. The specific epithet *breviramulus* is from the Latin and refers to the dwarf stature and short stems of the new species.

Discussion. *Senecio breviramulus* is allied to *S. covasii* Cabrera and *S. pumilus* Tortosa & Adr. Bartoli by its plants with ascending branchlets with the leaves congested at stem bases, but with the flowering shoots with scattered leaves. The new species can be distinguished from them by its smaller, narrowly elliptic leaves and the smaller, narrow heads with fewer florets (12 to 14 vs. 20 or more in both affined species). The new species is placed in series *Xerosenecio* because of the shape and size of the involucre, which we regard as having special taxonomic value to redefine the series (Tortosa & Bartoli, unpublished).

Paratype. ARGENTINA. **Neuquén:** Chos Malal, Vegas de Pelán, 36°54′S, 70°20′W, 24 Jan. 1964, *O. Boelcke 11120* (BAA).

Key to Species Allied to *Senecio breviramulus* in Patagonia

1a. Involucre campanulate, 5–6 × 4–5 mm; stems, leaves, and phyllaries lanuginose when young, loosely lanuginose or glabrate when mature. . . *S. covasii*
1b. Involucre obconic or narrowly obconical; stems, leaves, and phyllaries always lanuginose.

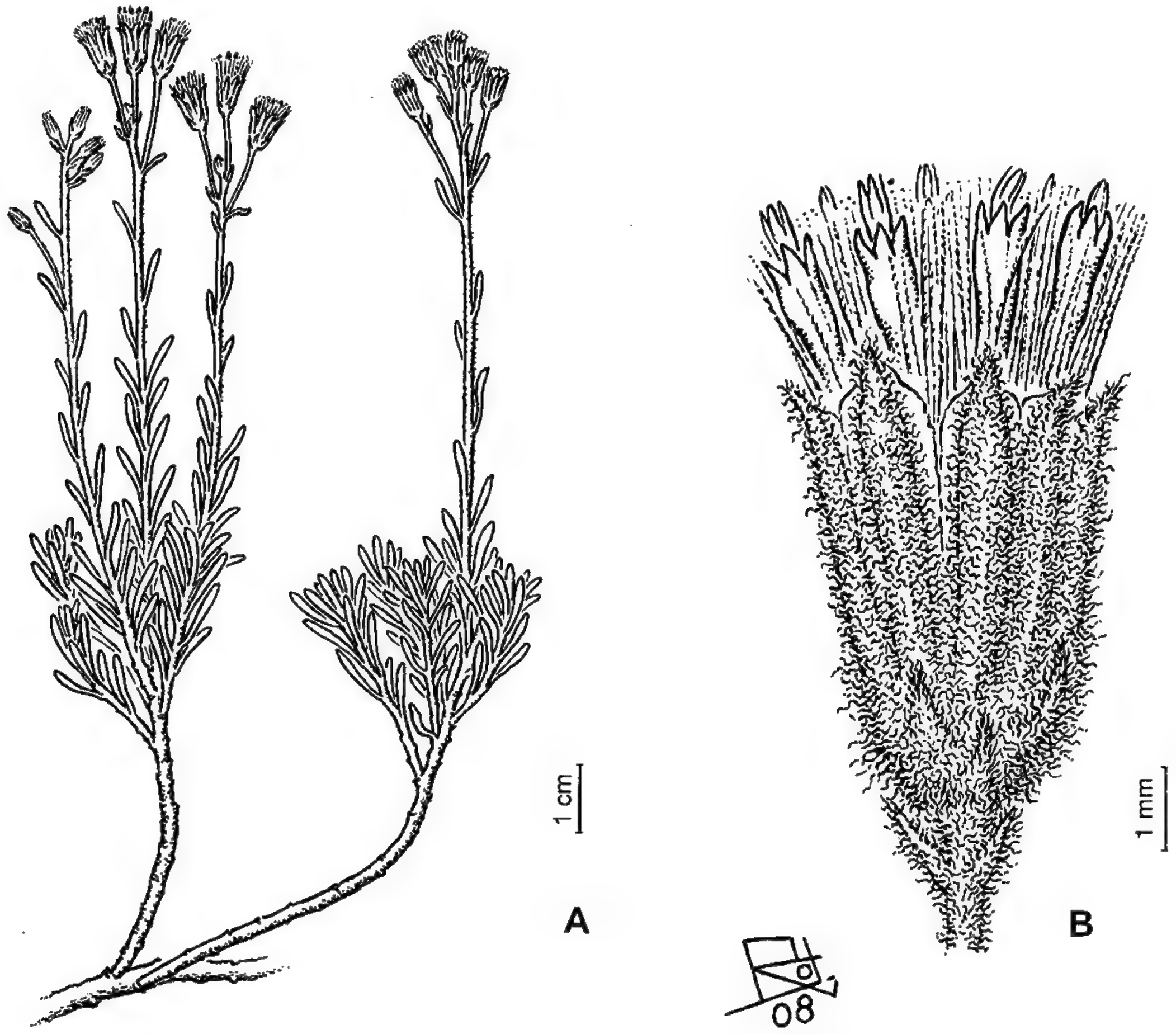

Figure 1. *Senecio breviramulus* Tortosa & Adr. Bartoli. —A. Fertile habit. —B. Capitulum. Drawn from the holotype *Movia s.n.* (BAA 17904).

2a. Involucre narrowly obconic, ca. 5 × 2.5 mm; florets 12 to 14; leaves narrowly elliptic, spatulate, 0.8–1.2 cm × 0.8–1.2 mm; flowering shoots 0.6–1 mm diam. . . . . *S. breviramulus*

2b. Involucre obconic, 6–7 × 3–3.5 mm; florets 20 to 24; leaves elliptic, 0.8–2 cm × 1.5–3 mm; flowering shoots 1.2–2 mm diam. . . . . *S. pumilus*

NEW VARIETY IN *SENECIO* SER. *SUFFRUTICOSI* SUBSER. *CANDIDI*

1. Senecio volckmannii Phil., Linnaea 33: 152. 1864. TYPE: Chile. Coquimbo: Cord. Santa Ana, ad balneas del Toro, s.d., *H. Volckmann s.n.* (holotype, SGO, photo LP).

1a. Senecio volckmannii var. **volckmannii**.

1b. Senecio volckmannii var. **pinohachense** Tortosa & Adr. Bartoli, var. nov. TYPE: Argentina. Neuquén: Dpto. Picunches, paso Pino Hachado, en el hito, "lígulas amarillas, muy vistosas," 38°39′S, 70°54′W, 2018 m, 10 Feb. 1970, *E. G. Nicora 7435* (holotype, BAA). Figure 2.

A varietate typica *Senecionis volckmannii* Phil. haec varietas floribus ligulatis praesentibus et pedunculis 1.5–4.5 cm longis differt.

Shrub 0.1–0.15 m tall, with dense white woolly indument mixed with glabrous zones on stems, leaves, and phyllaries. Leaves alternate, sessile, obovate-elliptic, not spatulate, 2–3(–3.5) cm × 3–6 mm, margins entire. Capitula radiate, solitary, pedunculate; peduncles 1.5–4.5 cm; involucre widely campanulate, ca. 12 × 10 mm; calycular bracts few, narrowly triangular, 5–8 mm; phyllaries 20 to 22, linear, acuminate. Ray florets pistillate, ca. 12; corolla yellow, tube ca. 5 mm, with scattered, short glandular trichomes in the basal portion; limb ca. 10 × 1.5–2.5 mm. Disk florets hermaphroditic; corolla yellow, ca. 9 mm, glabrous. Cypselae pubescent.

Distribution and habitat. *Senecio volckmannii* var. *pinohachense* occurs at the southern limit of the species range. The type collection was collected near

Figure 2. *Senecio volckmannii* Phil. var. *pinohachense* Tortosa & Adr. Bartoli. —A. Fertile habit. —B. Capitulum. Drawn from the holotype *Nicora 7435* (BAA).

the boundary between Argentina and Chile at an elevation of 2018 m. The paratype comes from a mountain chain that extends to 1523 m, located in western Neuquén Province, Argentina.

IUCN Red List category. There are only two collections representing this variety. It may be considered Critically Endangered (CR) according to IUCN Red list criteria (IUCN, 2001).

Etymology. The varietal epithet *pinohachense* is taken from the geographic location Pino Hachado, which refers to the name of the path where the type specimen was collected. In Spanish, "pino hachado" refers to a pine that has been cut down with an axe. The place name could allude to *Araucaria araucana* K. Koch, a native species.

Discussion. Senecio volckmannii is a South American species. The typical variety is found in northern Chile, in the regions of Antofagasta, Atacama, and Coquimbo, and in northwestern Argentina into Mendoza Province (see Cabrera et al., 1999; Tortosa & Bartoli, 2006). Among taxa of *Senecio* ser. *Suffruticosi* subser. *Candidi*, the parent species is characterized by its narrowly obovate-elliptic to broadly elliptic, spatulate leaves (vs. narrower blades in the new variety) with entire margins (rarely toothed), and sessile heads (vs. pedunculate). *Senecio volckmannii* var. *pinohachense* differs from the typical variety in its radiate and pedunculate heads.

Senecio volckmannii is sometimes found with *S. poeppigii* Hook. & Arn., which belongs to section *Streptothamnus* Greenm. The species are similar in having both discoid and radiate varieties. *Senecio poeppigii* differs, however, in having a different indument (white tomentose), smaller heads (involucre 8–9 mm high), fewer florets of flowers (ca. 40), and ray florets (when present) that lack glandular trichomes.

Paratype. ARGENTINA. **Neuquén:** Dpto. Aluminé, Cordón Rucachoroi, 39°16′S, 71°14′W, s.d., *V. Fleming s.n.* (Hb. L. Cusato 3932 b, BAA).

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The Galápagos Endemic *Darwiniothamnus alternifolius* (Asteraceae, Astereae) transferred to *Erigeron*

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Abstract. Following molecular phylogenetic evidence that the Galápagos (Ecuador) endemic genus *Darwiniothamnus* Harling (Asteraceae, Astereae) is biphyletic, with supporting evidence from several morphological traits, the species *D. alternifolius* is transferred to the genus *Erigeron* L. as *E. alternifolius* (Lawesson & Adsersen) N. Andrus & Tye.

Key words: *Darwiniothamnus*, Ecuador, *Erigeron*, Galápagos.

The genus *Darwiniothamnus* Harling (Asteraceae, Astereae) was erected in 1962 for two Galápagos endemic species, which Hooker (1847) originally assigned to *Erigeron* L. To the two original species, *D. lancifolius* (Hook. f.) Harling and *D. tenuifolius* (Hook. f.) Harling, a third was added with the discovery of *D. alternifolius* Lawesson & Adsersen (Lawesson & Adsersen, 1987). Two different growth forms were encompassed within the genus as so defined. *Darwiniothamnus lancifolius* and *D. tenuifolius* are woody shrubs that usually grow to 1–2 m in height and occasionally reach 3.5 m, have leaves condensed in terminal whorls with internodes much shorter than half the length of the leaves, a condensed corymbiform synflorescence more or less enclosed within the terminal leaves, and 3- to 6-nerved achenes (Harling, 1962; Lawesson & Adsersen, 1987). In contrast, *D. alternifolius* is a perennial herbaceous plant, woody only at the base, reaching up to 50 cm in height and having alternate leaves not condensed in terminal whorls, with internodes at least half the length of the leaves, a cymiform synflorescence that exceeds the terminal leaves, and with all achenes 2-nerved (Lawesson & Adsersen, 1987; pers. obs.). The three species were nevertheless considered to belong to a single genus because they possess many ray florets, imbricate phyllaria of unequal length, slightly dimorphic achenes, and an aromatic scent (Lawesson & Adsersen, 1987). Although Nesom (2000) recognized the differences between *D. alternifolius* and the two other species of the genus that had been previously noted, Nesom and Robinson (2007) maintained *Darwiniothamnus* as a monophyletic genus. *Darwiniothamnus* has always been considered closely related to *Erigeron* (Harling, 1962; Lawesson & Adsersen, 1987; Nesom, 1989), a large genus (s.l., ca. 400 spp.) of mostly herbaceous species within the subtribe Conyzinae (Nesom & Robinson, 2007; Nesom, 2008).

Harling (1962) suggested that the closest relative of *Darwiniothamnus* could be among shrubby species of *Erigeron* endemic to coastal Chile, specifically *E. fasciculatus* Colla (as *E. berterianus* DC.) or *E. luxurians* (Skottsb.) Solbrig (as *E. litoralis* (Phil.) Skottsb.), or any of the six species endemic to the Juan Fernández Islands, 600 km off the Chilean coast. Lawesson and Adsersen (1987) preferred the latter hypothesis, noting further that *D. alternifolius* is "even more similar to *E. fernandezianus*" (Colla) Harling than are the other species of *Darwiniothamnus*. Johnston (1931) and Nesom (1989), in contrast, suggested that *Darwiniothamnus* might have their closest relatives in the Northern Hemisphere, with candidates *E. crenatus* Eastw. and *E. socorrensis* Brandegee from the Revillagigedo Islands (Johnston, 1931), or two groups of mainly Caribbean and Mexican *Erigeron* (Nesom, 1989, 2000).

A recent molecular study of the three species of *Darwiniothamnus*, using nucleotide sequences of the internal transcribed spacers of nuclear ribosomal DNA (Andrus et al., 2009), indicates that *Darwiniothamnus* is biphyletic, with both northern and southern origins. *Darwiniothamnus lancifolius* and *D. tenuifolius* form a monophyletic assemblage that shares a recent common ancestor with the Cuban endemic *Erigeron bellidiastroides* Griseb. The latter nests with a number of Greater Antillean endemics grouped as *Erigeron* sect. *Microcephalum* Nesom (Nesom, 2008). *Darwiniothamnus alternifolius* shares recent ancestry with Chilean species of *Erigeron*, forming a clade with *E. luxurians* and *E. fasciculatus* (as suggested by Harling [1962] for the other two *Darwiniothamnus* species, but to which they are not closely related [Andrus et al., 2009]), and nested with *Erigeron* sect. *Meridionales* Nesom & Andrus, which is otherwise composed exclusively of South American mainland species (Nesom, 2008).

While logical nomenclatural assignment of the *Darwiniothamnus lancifolius–D. tenuifolius* clade

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awaits a fuller revision of the genus *Erigeron* and its close relatives (Nesom, 2008), these findings require removal of *D. alternifolius* from the genus *Darwiniothamnus*. This taxon is therefore transferred to:

Erigeron alternifolius (Lawesson & Adsersen) N. Andrus & Tye, comb. nov. Basionym: *Darwiniothamnus alternifolius* Lawesson & Adsersen, Opera Bot. 92: 10. 1987. TYPE: Ecuador. Galápagos: Isabela Island, Sierra Negra Volcano, NW slope, 700 m, 18 Nov. 1985, *J. E. Lawesson, H. Adsersen, B. Nowak, A. M. Velasco, S. Abedrabbo & A. Tupiza 2452* (holotype, QCA; isotypes, C not seen, CDS).

IUCN Red List category. The species has for some time been listed as Critically Endangered (CR A2ace) (Tye, 2000, in press) according to IUCN Red List criteria (IUCN, 2001), owing to a sharp decline in recent decades due to habitat loss and pressure from introduced herbivores in its only known sites on southern Isabela Island.

Acknowledgments. This note stems from the meticulous phylogenetic study of *Darwiniothamnus* by Nicole Andrus, whom I thank for her insightful discussions of these species. Nicole's father Gary Andrus provided immense support for the project, including assistance with fieldwork, finance, and equipment, and I dedicate this paper to his memory. Conley McMullen, Javier Francisco-Ortega, Guy Nesom, and Duncan Porter contributed discussion and/or comments on the manuscript. This is contribution no. 1082 of the Charles Darwin Research Station.

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Gastrochilus brevifimbriatus (Orchidaceae, Aeridinae), a New Species from Chongqing, China

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ABSTRACT. *Gastrochilus brevifimbriatus* S. R. Yi is described and illustrated as a new species of *Gastrochilus* D. Don (Orchidaceae, Aeridinae) from Jinfo Mountain, Chongqing Province, China. This new species is related to *G. acinacifolius* Z. H. Tsi, with both species characterized by the falcate, lanceolate leaves, the inflorescences opposite to the leaves, the yellow sepals and petals with purple spots, the similar petals and sepals, and the white lip. *Gastrochilus brevifimbriatus* differs by its longer stems (10–30 cm) and by the subflabellate epichile that is broader than the hypochile and has short fimbriae on the margins.

Key words: China, Chongqing, *Gastrochilus*, IUCN Red List, Orchidaceae.

The genus *Gastrochilus* D. Don (Orchidaceae, Aeridinae) is characterized by a saccate hypochile and two porate pollinia and comprises about 50 species that are widely distributed in tropical and subtropical Asia. Thirty-one species are recorded in China, and three species are known from Chongqing Province (Seidenfaden, 1988; Tsi, 1996, 1999; Lucksom, 2003; Jin et al., 2007; Shakya & Shrestha, 2007). The two species *G. fargesii* Schltr. and *G. nanchuanensis* Z. H. Tsi are endemic to Chongqing, while *G. intermedius* Kuntze, originally described from India, is distributed at altitudes of 1500 m in Nanchuan County, in southern Chongqing.

The Jinfo Mountain Nature Reserve, located in southern Chongqing Province, ranges in elevation from 340 to 2251 m (Yi & Huang, 2004); it is one of the most important floristic areas in southwestern China and has been considered a refugium area during glacial ice ages (Li, 1940; Guo, 1943). There are about 354 families, 1720 genera, and 6204 species of vascular plants, including 96 endemic species, that are native to Jinfo Mountain (Yi & Huang, 2004; Yi et al., 2007, 2008). In total, 110 orchid species are recorded for this region.

In 2007, an unknown entity of *Gastrochilus* with one isolated population was found on Jinfo Mountain during an excursion to collect plant specimens for a project investigating economic plants of karst regions in Chongqing. The resulting taxonomic examination revealed this *Gastrochilus* to be a new and distinct species.

Gastrochilus brevifimbriatus S. R. Yi, sp. nov. TYPE: China. Chongqing: Nanchuan Co., Hou he, Jinfo Mtn., on trunk, 680 m, 29 Aug. 2007, *Yi Si Rong 075631* (holotype, IMC). Figures 1, 2.

Haec species habitu *Gastrochilo acinacifolio* Z. H. Tsi subsimilis, sed ab eo caulibus 10–30 cm longis, foliis minoribus atque epichilo subflabellato hypochilo latiore margine brevifimbriato differt.

Epiphytic plant; stems 10–30 cm, terete, 2.8–3.2 mm diam. Leaves distichous, many, falcate to lanceolate, 6–9 × 0.8–1 cm, acute, unevenly bilobed, base sheathed and jointed; leaf sheaths tightly amplexicaul, 6–7 mm. Inflorescences opposite to leaves, 0.8–1.2 cm, 2.6–3 mm diam.; spike short, umbelliform, 2- to 4-flowered. Infertile bracts 2 to 3, tubular. Floral bracts triangular, small, 1.4–1.6 mm; pedicel and ovary 1.5–2 cm, ovary 1.5–1.8 mm diam.; sepals and petals white, tinged with yellow and spotted purple, lip white; dorsal sepal and lateral sepals similar, ovate to lanceolate, 5–6 × 2–3 mm, obtuse; petals similar to sepals, 4.3–5.2 × 1.6–2.2 mm, obtuse; lip 3-lobed; epichile ovoid to oblong, flattened, fimbriate; disk thickened and fleshy, nearly round, orange with purple spots, 2–2.3 mm; hypochile white, galeiform, ca. 5 × 3.2–3.5 mm, orange with purple maculae, bottom yellow with purple spots; lateral lobes circular, 2.8–3.2 × 3.4–3.8 mm, with purple stripes; column stout, ca. 2 mm; rostellum bilobed, lobes denticulate, ca. 1 mm, base narrow and flattened, ca. 1.7 mm; anther cap slightly obtuse and narrowly triangular with recurved-acuminate apex, 1.5–1.8 × 1.8–2.2 mm; pollinia 2, ca. 0.7 mm diam.; viscidium thick and bilobed. Capsules cylindrical with 3 dark stripes, 25–35 × 7–7.5 mm.

Distribution and habitat. Gastrochilus brevifimbriatus was observed on tree trunks at altitudes from 670 to 750 m in a moist valley on Jinfo Mountain in Chongqing Province. Associates of the new species include more than 90 native plants such as *Alpinia nanchuanensis* Z. Y. Zhu, *Begonia pedatifida* H.

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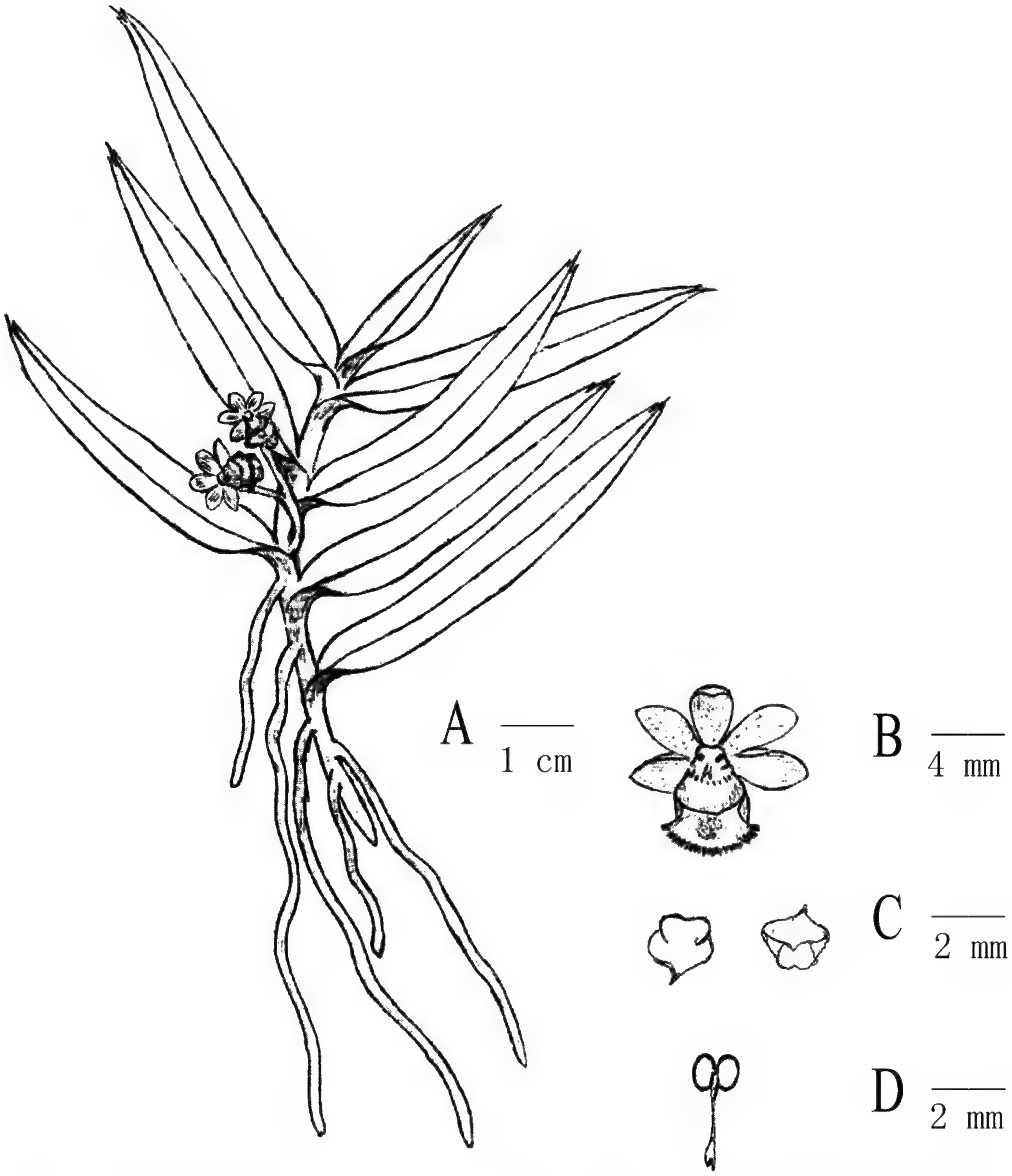

Figure 1. *Gastrochilus brevifimbriatus* S. R. Yi. —A. Fertile habit. —B. Flower. —C. Operculum (left, dorsal; right, ventral). —D. Pollinia. Drawn from the holotype *Yi 075631* (IMC).

Lév., *Chimonobambusa pachystachys* Hsueh f. & T. P. Yi, *Colysis henryi* (Baker) Ching, *Debregeasia orientalis* C. J. Chen, *Dryopteris sieboldii* (van Houtte) Kuntze, *Ficus tsiangii* Merr. ex Corner, *Glaphyropteridopsis jinfushanensis* Ching & Y. X. Lin, *Gymnotheca chinensis* Decne., *Houttuynia cordata* Thunb., *Microsorum fortunei* (T. Moore) Ching, *Neolepisorus ensatus* (Thunb.) Ching, *Phaius flavus* (Blume) Lindl., *Piper wallichii* (Miq.) Hand.-Mazz., *Podocarpus neriifolius* D. Don, *Polystichum acutidens* Christ, *Vittaria flexuosa* Fée, *Zingiber striolatum* Diels, and others.

IUCN Red List category. *Gastrochilus brevifimbriatus* is endemic to Jinfo Mountain, which has a distributional area of less than 1 km^2. The new species is considered as Critically Endangered (CR) according to IUCN Red List criteria (IUCN, 2000).

Figure 2. *Gastrochilus brevifimbriatus* S. R. Yi. —A. Habit. —B. Infrutescence. —C. Inflorescence. —D. Flower. —E. Operculum and pollinia. Photo by S. R. Yi.

Phenology. *Gastrochilus brevifimbriatus* was observed in flower from August to September, while fruits were seen from October to November of the next year.

Etymology. The specific epithet *brevifimbriatus* refers to the fimbriate marginal lobes of the apex of the labellum.

Discussion. The new species is morphologically similar to *Gastrochilus acinacifolius* Z. H. Tsi. Both taxa have falcate, lanceolate leaves, inflorescences that are opposite the leaves, yellow petals and sepals with purple spotting, and a white lip. *Gastrochilus brevifimbriatus*, however, is easily distinguished by its longer stems (10–30 cm vs. 8–11 cm in *G. acinacifolius*), smaller leaf blades (6–9 × 0.8–1 cm vs. 7–14 × 1–2 cm), ovate-lanceolate dorsal sepal (vs. obovate-spatulate), and ovoid to oblong epichile with a fimbriate margin and purple maculae at the base of the spur (vs. a long to circular or flat to circular epichile with a dentate margin and purple maculae at the base of the yellow pad). *Gastrochilus fargesii*, *G. nanchuanensis*, and *G. intermedius* are distributed in the same region with *G. brevifimbriatus*, and their morphological differences are shown in Table 1.

Paratypes. CHINA. **Chongqing:** Nanchuan Co., Hou he, Jinfo Mtn., on trunk, 670 m, 11 Sep. 2006 (fl.), *Yi Si Rong 064752* (IMC), on trunk, 680 m, 26 Aug. 2007 (fr.), *Yi Si Rong 075617* (PE).

Table 1. Morphological comparision of *Gastrochilus brevifimbriatus* and three congeners.

	G. brevifimbriatus	*G. fargesii*	*G. nanchuanensis*	*G. intermedius*
Stem	10–30 cm long, 2.8–3.2 mm diam.	3–13 cm long, ca. 2 mm diam.	4–7 cm long, ca. 2 mm diam.	ca. 15 cm long, 3–4 mm diam.
Leaf	falcate to lanceolate, 6–9 × 0.8–1 cm	long-circular, 2–4.5 × 0.4–0.6 cm	ovate, 1.3–1.6 × 0.6–0.9 cm	narrowly lanceolate, 5–6 × 0.7–1 cm
Inflorescence	0.8–1.2 cm long, 2- to 4-flowered	0.5–1 cm long, 2- to 3-flowered	0.5–0.7 cm long, 2- to 3-flowered	ca. 1 cm long, 2- to 3-flowered
Flower	sepals and petals white, sepal ovate to lanceolate, 5–6 × 2–3 mm; petal ovate to lanceolate, 4.3–5.2 × 1.6–2.2 mm; epichile ovoid to oblong, fimbriate	sepal and petals yellow-green, sepal ovate to long-circular, ca. 4 × 2 mm; petal long-circular, ca. 3 × 1.5 mm; epichile triangular, dentate	sepal ovate, ca. 4.2 × 3.5 mm; petal long-circular, ca. 4.1 × 2.9 mm; epichile semicircular or reniform	sepal ovate, ca. 5.5 × 2.5 mm; petal inverted-ovate, ca. 5 × 2 mm; epichile semicircular or triangular
Fruit	capsules cylindrical with 3 dark stripes, 25–35 × 7–7.5 mm	NA	NA	NA

NA, not available.

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A New Species of *Erigeron* (Asteraceae) from Sichuan, China

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ABSTRACT. *Erigeron latifolius* Hao Zhang & Z. F. Zhang (Asteraceae, Astereae), a new species of *Erigeron* L. from Sichuan, China, is described and illustrated. It is similar to *E. multiradiatus* (Lindl. ex DC.) Benth. ex C. B. Clark, but can be distinguished by features of the flowers and leaves. The capitula are small (1.2–2.5 cm); the anthers do not protrude beyond the corolla; the midcauline leaves are large (8–15 × 1–2.5 cm) and lanceolate to oblong-lanceolate; and the distal leaves are lanceolate, dense, and not much reduced, but smaller (2–5 × 0.5–1 cm). The new species is endemic to China and is identified as Endangered (EN), according to IUCN Red List criteria.

Key words: Asteraceae, Astereae, China, *Erigeron*, IUCN Red List, Sichuan.

Erigeron L. (Asteraceae, Aster tribe), with ca. 400 species worldwide, is distributed mainly on the northern American and Eurasian continents. In China, 35 species are recorded and principally occur on the Qinghai-Tibetan Plateau, which is the center of diversity for *Erigeron*. The species are divided into two subgenera including subgenus *Erigeron* and subgenus *Trimorpha* (Cass.) Popov (Ling & Chen, 1973, 1985).

Since the 1980s, there have been few reports on the taxonomy of *Erigeron* in China. A new variety of *E. breviscapus* (Vaniot) Hand.-Mazz. was described from Yunnan in 2003 as variety *leucanthus* X. D. Dong & Ji H. Li (Dong & Li, 2003). In our previous study, the morphology of several *Erigeron* species from the European Alps was investigated (Walter & Zhang, 1991), as well as the distribution and chemical constituents of *Erigeron* species from the Qinghai-Tibetan Plateau (Zhang et al., 1998; Hu et al., 2001, 2005; Zhang et al., 2003; Zhang & Zhang, 2004).

During continued expeditions and sample collecting on the Qinghai-Tibetan Plateau, a new herbaceous *Erigeron* was discovered, which exhibits morphological characters distinctive from other species of this genus.

Erigeron latifolius Hao Zhang & Z. F. Zhang, sp. nov. TYPE: China. Sichuan: Ma'erkang Co., Mt. Zhegu, meadow of mtn. slope & scrub edge, 3100 m, 13 July 2007, *Z. F. Zhang & J. G. Wang 07001* (holotype, SZ; isotype, WCU). Figure 1.

Species haec habitu *Erigeronti multiradiato* (Lindl. ex DC.) Benth. ex C. B. Clark similis, a quo foliis caulinis inferioribus et mediis sessilibus oblongo-lanceolatis vel lanceolatis 8–15 cm longis, capitulis minoribus 1.2–2.5 cm diam., phyllariis extensis 0.8–1 cm longis atque antheris corollas non superantibus bene differt.

Perennial herb, 25–50 cm tall; rhizomatous and fibrous-rooted, erect to ascending, caudices simple or branched, with persistent old leaf bases; stems simple or branched from base, erect, green proximally, striate, sparsely strigose and villous, less commonly hirtellous and stipitate-glandular, stem internodes 2–7 cm. Leaves basal and cauline; basal blades in rosettes, usually withering by flowering, oblong-oblanceolate to oblanceolate, 7–13 × 0.7–1.5 cm, margins entire, apex acute to obtuse, basal petiole 10–15 cm, 3- to 5-nerved, blades sparsely strigose to villous and stipitate-glandular; lower and midcauline blades without a petiole, lanceolate to oblong-lanceolate, 8–15 × 1–2.5 cm, margins entire, apex acute to obtuse, bases auriculate-clasping; distal leaves relatively dense, lanceolate, densely white-villous, 2–5 × 0.5–1 cm, apex acuminate. Capitula 1 or 2 to 7 in corymbiform arrays, 1.2–2.5 cm diam.; involucres 0.8–1.5 × 0.8–1.2 cm, outer involucral bracts shorter than inner ones; phyllaries in 3 series, linear-lanceolate, moderately woolly villous, lustrous green, 8–10 × 1–2 mm, longer than the conspicuous disk, apex acuminate, purple. Ray (pistillate) florets in 3 series, the outer series numbering from 150 to 250(to 400) florets, corollas usually purple, 5–10 mm,

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Figure 1. Paratype of *Erigeron latifolius* Hao Zhang & Z. F. Zhang from Ma'erkang County, Sichuan, China (*Zhang & Wang E070892*, WCU).

laminae not coiling; disk florets numbering from 250 to 450, bisexual, corollas tubular, corolla 5–7 mm, tube 1.5–2 mm, limb campanulate, 5-lobed at apex, lobes short-triangular, 0.5–1 mm, purple, anthers not protruding beyond corolla. Cypselae oblong, 2–3 mm, tan, compressed, 1-ribbed, sparsely hispidulous; pappi in 2 series, as white bristles, outer pappi short, interior ca. 4 mm.

Distribution and habitat. Only known from its type locality on Mt. Zhegu, Ma'erkang County, Sichuan Province, China, *Erigeron latifolius* was observed as common in the montane meadow and at the edge of scrub. It occurred with the associated taxa *Cephalonoplos segetum* (Bunge) Kitam., *Pulsatilla chinensis* (Bunge) Regel, and *Aconitum kusnezoffii* Rchb.

IUCN Red List category. *Erigeron latifolius* is only known from a small area in Ma'erkang County and grows commonly in thickets. Based on our expedition in recent years in Ma'erkang County, we find the area of occupancy of this species to be limited, and the number of the mature individuals is declining. Therefore, this taxon is best assessed as Endangered (EN) according to IUCN Red List criteria (IUCN, 2001).

Phenology. The new species was collected in July, but observed to flower June through September.

Etymology. The specific epithet refers to the leaves, which are wide and densely arranged at the middle and distal parts of the stem.

Discussion. The new species is quite similar to *Erigeron multiradiatus* (Lindl. ex DC.) Benth. ex C. B. Clark, but can be distinguished by characters of its flowers and leaves, as shown in the following couplet. We intend to further investigate the taxonomy by microscopic technique and molecular methods.

1a. Lower and midcauline leaves 8–15 × 1–2.5 cm, with distal leaves 2–5 × 0.5–1 cm, not much reduced from the lower; capitula 1.2–2.5 cm diam.; anthers included within the corollas . . . . . *Erigeron latifolius*

1b. Lower and midcauline leaves 4–6 × 0.5–2 cm, gradually reduced distally; capitulae 3–4 cm diam.; anthers exserted from the corollas . . . . . *Erigeron multiradiatus*

Paratype. CHINA. **Sichuan:** Ma'erkang Co., meadow of mtn. slope & scrub edge, 3100 m, 13 July 2007, *Z. F. Zhang & J. G. Wang E070892* (WCU).

Acknowledgments. The authors thank the Bureau of Science and Technology of Sichuan Province for the support of the applied fundamental study (grant no. 2006Z08-081) and the Ministry of National Education Doctoral Fund (No. 20020610089) for providing financial support.

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—*Votis gratias agamus.*

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Two New Species of *Ocotea* (Lauraceae) from the Brazilian Restinga

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Abstract. Two new species of *Ocotea* Aubl. (Lauraceae) from the restinga of Brazil are described and illustrated. *Ocotea arenicola* L. C. S. Assis & Mello-Silva and *O. ramosissima* L. C. S. Assis & Mello-Silva are discovered from Espírito Santo and Bahia states, respectively. Their diagnostic features are indicated, and their relationships to other *Ocotea* species are discussed.

Resumo. Duas espécies novas de *Ocotea* Aubl. (Lauraceae) da restinga do Brasil são descritas e ilustradas. *Ocotea arenicola* L. C. S. Assis & Mello-Silva e *O. ramosissima* L. C. S. Assis & Mello-Silva são respectivamente descobertas nos Estados do Espírito Santo e Bahia. Suas características diagnósticas são indicadas e suas relações com outras espécies de *Ocotea* são discutidas.

Key words: Bahia, Brazil, Espírito Santo, IUCN Red List, Lauraceae, *Ocotea*, restinga.

Ocotea Aubl., the largest Neotropical genus of Lauraceae, comprises ca. 300 to 350 species in the Neotropics plus ca. 50 to 60 species in Africa and Madagascar (Rohwer, 1993; Madriñán, 2004). It is not taxonomically well defined, but the species can be characterized by stamens with four pollen sacs arranged in two horizontal pairs, as well as by flowers that generally lack papillae and have free tepals (van der Werff, 1991, 2002). The genus is highly diversified in Neotropical lowland to montane forests (Rohwer, 1993; Madriñán, 2004), but the two species described here are notable for occurring in particular forest associations or restingas along the Brazilian coast (Veloso et al., 1991), although *O. arenicola* L. C. S. Assis & Mello-Silva also grows in vegetation locally called mussununga or nativo (Peixoto & Gentry, 1990).

As defined here, flower length includes the pedicel. Papillae, defined as epidermal projections and considered subsets of trichomes (Metcalfe & Chalk, 1979), occur on the tepals and stamens. Branchlets with short internodes and cataphylls surrounding buds and inflorescences are always associated with rhythmic growth, which can be diagnosed by its periodicity and by the leaves distinctly clustered at the top of the branchlets (Hallé et al., 1978). The species concept adopted here is the taxonomic species concept, in which a species is defined by an exclusive feature or a combination of features (Stuessy, 1990). Geographic distribution and habitat complement species circumscription (Jablonski, 2008). Theoretically, species are treated here as natural entities because they are diagnosed by their morphological properties (Rieppel, 2007; Assis & Brigandt, 2009).

1. Ocotea arenicola L. C. S. Assis & Mello-Silva, sp. nov. TYPE: Brazil. Espírito Santo: Guarapari, Parque Ecol. Setiba, restinga, 26 Nov. 1992 (fr.), *V. Souza 410* (holotype, SPF; isotype, CVRD). Figure 1.

Species *Ocoteae lobbii* (Meisn.) Rohwer proxima, sed ab ea petiolis longioribus, foliis persaepe domatiis praesentibus, receptaculo extus semper pubescenti vel tomentoso, cupula majore margine unico et fructibus majoribus differt.

Trees to shrubs (3–)5–7(–12) m tall; branchlets with shortened internodes, young branchlets gray to brown, sparsely to densely pubescent to tomentose, rhytidome absent, older branchlets gray, glabrous. Leaves with

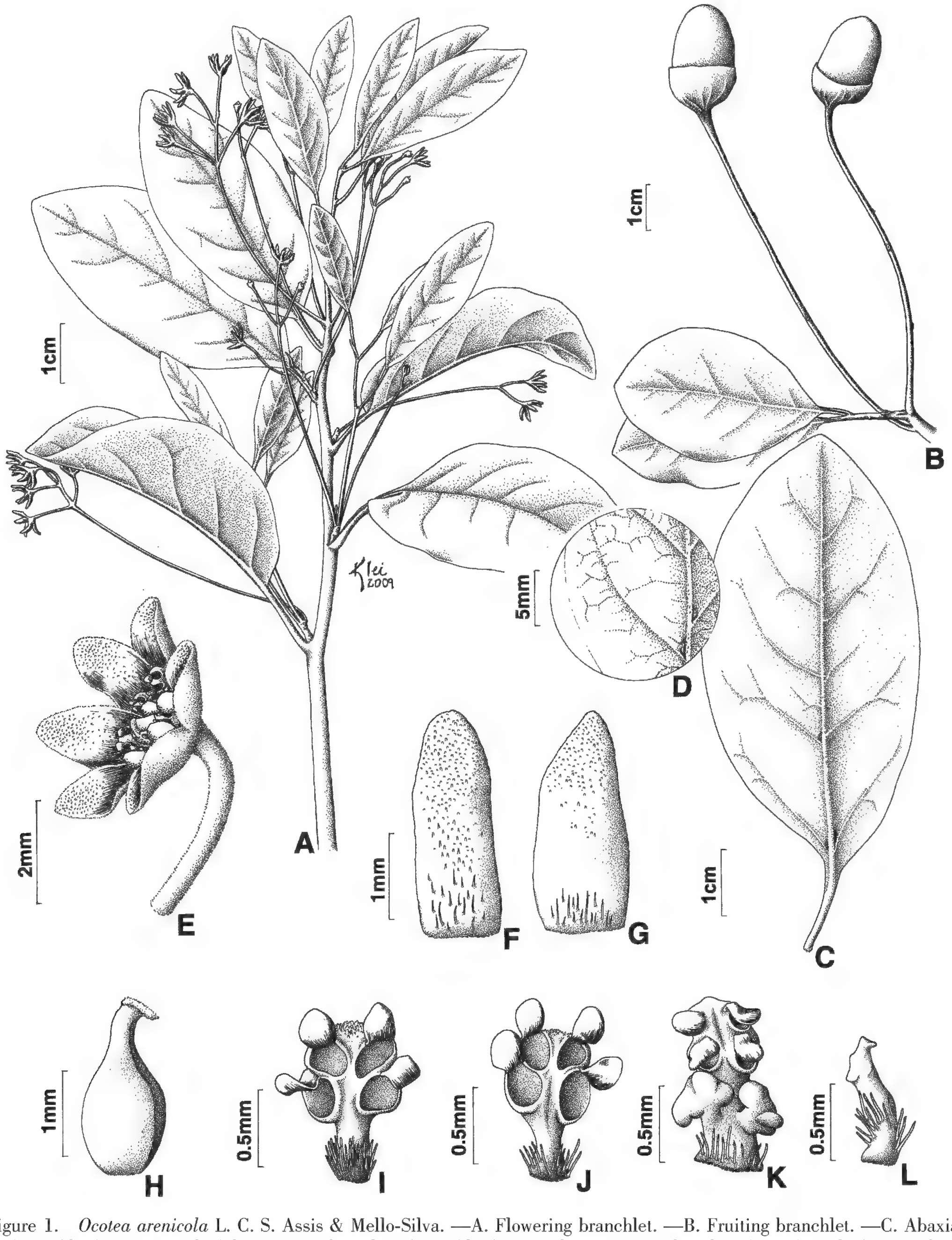

Figure 1. *Ocotea arenicola* L. C. S. Assis & Mello-Silva. —A. Flowering branchlet. —B. Fruiting branchlet. —C. Abaxial surface of leaf. —D. Detail of domatia on abaxial surface of leaf. —E. Flower. —F. Adaxial surface of tepal of outer whorl. —G. Adaxial surface of tepal of inner whorl. —H. Gynoecium. —I. Adaxial surface of stamen from whorl I. —J. Adaxial surface of stamen from whorl II. —K. Abaxial surface of stamen from whorl III. —L. Adaxial surface of staminodium from whorl IV. A, C–L drawn from the paratype *A. M. Assis & O. J. Pereira 618* (SPSF); B drawn from the holotype *V. Souza 410* (SPF).

petiole (4–)7–17 × 1–2 mm; lamina 2.5–8.7(–10) × (0.6–)1.1–3.8(–4.6) cm, plane, elliptic, rarely obovate, base acute to obtuse, apex slightly caudate, rounded to obtuse, adaxial surface glabrous, venation flat or sunken, abaxial surface glabrous to glabrescent, venation raised, secondary veins in 6 to 10 pairs, at a 35°–70° angle with the primary vein, areoles 0.2–0.5 mm diam., domatia generally present; cataphylls 1–5 × 1–2 mm, abaxial side densely sericeous to tomentose. Short shoots bearing the inflorescence 2–

8 mm. Inflorescences 1–5.3 cm, botryoid to thyrsoid, on the axils of cataphylls or leaves, stems sparsely to densely pubescent to tomentose. Flowers bisexual, 4–7(–12) mm; pedicel 1.5–3.5(–10) mm; receptacle 0.8–2 × 1–2 mm, both surfaces sparsely to densely pubescent to tomentose or the inner surface glabrous; tepals 1.2–4 × (0.7–)1–2 mm, elliptic, ovate, obovate, oblong, to narrowly elliptic, adaxial surface sparsely to densely papillose, abaxial surface sparsely pubescent. Androecium with 9 stamens, whorls I and II 0.8–1.3 mm; filaments 0.3–0.7 mm, sparsely to densely pubescent; anthers 0.4–0.7 × 0.4–0.7 mm, elliptic, oblong, circular, to square, sparsely papillose, apex ca. 0.1 mm, rounded, obtuse to emarginate, rarely truncate; upper pollen sacs introrse, lower pollen sacs latero-introrse; whorl III 0.8–1.3 mm; filaments 0.4–0.7 mm, sparsely pubescent; anthers 0.5–0.6 × 0.4–0.6 mm, elliptic, square, oblong, to transversely oblong, glabrous to sparsely papillose, apex rounded, obtuse to emarginate; upper pollen sacs latrorse, latero-apical, to latero-extrorse, lower pollen sacs latrorse to latero-extrorse, one pair of glands paired at the base of whorl III stamens; staminodia 3 (whorl IV), 0.5–0.8(–1.1) mm, clavate to filiform, sparsely to densely pubescent. Gynoecium with the ovary 0.9–1.3 mm, ellipsoid; style 0.3–0.8 mm. Cupules (0.5–)0.8–1.1 × (1.1–)1.4–1.7 cm, hemispheric, margin single, entire after development of fruits, lenticels absent, tepals deciduous; fruits 1.7–2 × (1–)1.3–1.5 cm, ellipsoid.

Distribution and habitat. *Ocotea arenicola* are trees or shrubs endemic to Espírito Santo State in Brazil, where the taxon grows in sandy open areas near the sea generally called restinga and, more locally, in vegetation called mussununga or nativo. These latter vegetation types consist of small trees with a dense understory (Peixoto & Gentry, 1990), occurring at elevations from 5 to 27 m and surrounded by tabuleiro forest, ca. 40 km from the coast. From north-central Espírito Santo to southeastern Bahia, tabuleiro forest is nearly synonymous with lowland rainforest (Barbosa & Thomas, 2008).

IUCN Red List category. *Ocotea arenicola* is known from no more than 10 localities in Espírito Santo State. According to IUCN Red List criteria (IUCN, 2001), the species is considered Vulnerable (VU B1a).

Phenology. *Ocotea arenicola* has been collected with flowers or fruits from March to November.

Etymology. The specific epithet refers to the sandy soils on which the new species lives.

Relationships. The new species *Ocotea arenicola* is included in the *O. indecora* (Schott) Mez group, which, under a wider circumscription than Rohwer's (1986; see also Assis et al., 2005), encompasses 20 species and is defined by the rhythmic growth of the branchlets, the only morphological synapomorphy inferred (Assis, 2009; Assis & Mello-Silva, 2009, 2010). Among these species, it most resembles *O. lobbii* (Meisn.) Rohwer, a widespread species from Bahia to Santa Catarina states, which is also found in restinga and mussununga associations. However, *O. arenicola* has larger petioles ([4–]7–17 mm vs. 1–5 mm in *O. lobbii*), leaves generally with domatia (vs. always lacking domatia), the outer surface of the receptacle sparsely to densely pubescent (vs. glabrous, glabrescent, or sparsely to densely pubescent), larger cupules ([0.5–]0.8–1.1 × [1.1–]1.4–1.7 cm vs. 0.1–0.7 × 0.4–0.9 cm) with a single margin (vs. doubled margin), and larger fruits (1.7–2 × [1–]1.3–1.5 cm vs. 0.9–1.1 × 0.5–0.6 cm).

Paratypes. BRAZIL. **Espírito Santo**: Conceição da Barra, 19 Oct. 1983 (fl.), *G. G. Hatschbach & G. Guimarães 47002* (MBM, MO); Área 157 da Companhia Aracruz Celulose, 24 Aug. 1993 (fr.), *O. J. Pereira et al. 4741* (SPSF, VIES), 25 Oct. 1993 (fl.), *O. J. Pereira et al. 5139* (SPSF, VIES); Guarapari, Setiba, Parque Est. Paulo C. Vinha, 5 Sep. 1998 (fl.), *A. M. Assis & O. J. Pereira 618* (SPSF, VIES); Itaunas, 24 Aug. 1987 (fl.), *G. G. Hatschbach & A. C. Cervi 51436* (MBM, MO); Linhares, Reserva Biol. Comp. Vale Rio Doce, área de nativo F, 16 Sep. 1987 (fl.), *D. Araújo & M. Domingos 8116* (GUA, SPF); Estr. Jueirana Vermelha, próximo ao rio Barra Seca, 31 July 1985 (fl.), *G. L. Farias 67* (CVRD, MO, SPF), 24 July 2003 (fr.), *G. S. Siqueira 28* (CVRD, SPF); Estr. J. Vermelha, ao lado do rio Barra Seca, antigo Porto Velho, 31 Aug. 1993 (fr.), *D. A. Folli 1972* (CVRD, SPF); Estr. J. Vermelha, Km 2.5, 24 July 2003 (fl.), *F. Z. Saimer 10* (CVRD, SPF); Final da estrada Bomba d'Água, lado direito da estrada, 19°06′37.9″S, 39°53′16.9″W, 7 July 2006 (fr.), *L. C. S. Assis, L. M. Borges, G. Siqueira & M. Trovó 1166* (CVRD, SPF); margem do rio Barra Seca, 19°04′58″S, 39°53′2″W, 31 Oct. 2007 (fr.), *V. F. Mansano, G. S. Siqueira & P. J. Fernandes 07-429* (MBM, MO, NY, RB, SPF); Presidente Kennedy, Praia das Neves, 9 May 1990 (fl.), *P. Vinha 838* (CVRD, MO, SPF); Vitória, Restinga de Interlagos II, Bairro Jucu, lado oposto ao Araçás, 10 Oct. 1986 (fr.), *B. Weinberg 3502* (SPF, SPSF); Res. Ecol. Camburi, 7 May 1990 (fl.), *P. Vinha 821* (CVRD, MO, SPF); s. loc., 1 Mar. 1998 (fr.), *L. L. Lorenzoni s.n.* (ESA 49431, SPF, SPSF).

2. Ocotea ramosissima L. C. S. Assis & Mello-Silva, sp. nov. TYPE: Brazil. Bahia: Canavieiras, entrada à direita, ca. 14 km na estrada de Canavieiras para Una, ca. 3.2 km da entrada, Região do Cotovelo, 15°33′S, 38°58′W, 18 Feb. 2003 (fl.), *P. Fiaschi, J. L. Paixão, S. C. Sant'Ana & J. G. Jardim 1319* (holotype, SPF; isotypes, CEPEC, MO not seen). Figure 2.

Species *Ocoteae fasciculatae* (Nees) Mez proxima, sed ab ea brachyblastis longioribus et fructibus sphaericis vel obovoideis facile distinguitur.

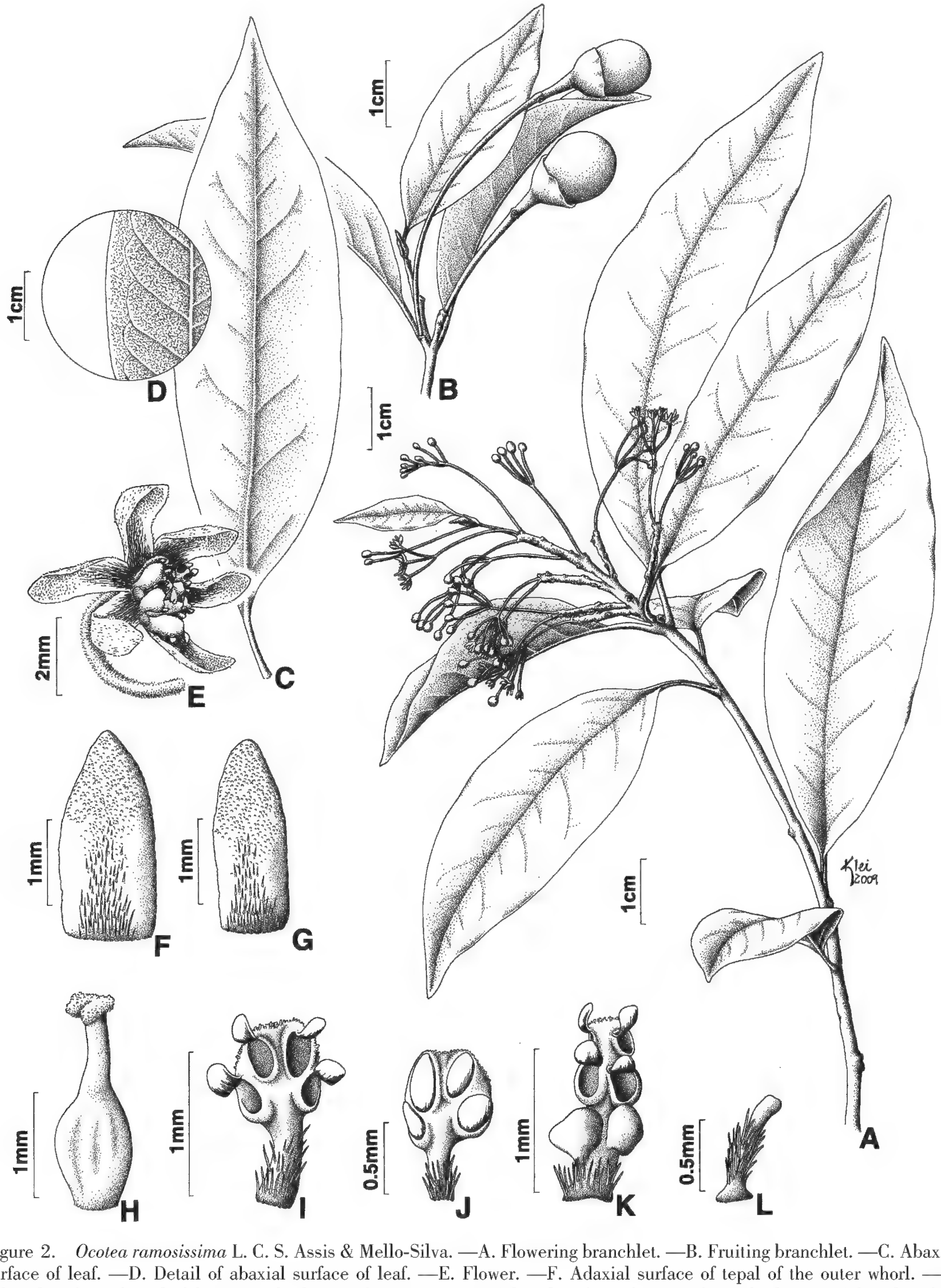

Figure 2. *Ocotea ramosissima* L. C. S. Assis & Mello-Silva. —A. Flowering branchlet. —B. Fruiting branchlet. —C. Abaxial surface of leaf. —D. Detail of abaxial surface of leaf. —E. Flower. —F. Adaxial surface of tepal of the outer whorl. —G. Adaxial surface of tepal of the inner whorl. —H. Gynoecium. —I. Adaxial surface of stamen from whorl I. —J. Adaxial surface of stamen from whorl II. —K. Abaxial surface of stamen from whorl III. —L. Adaxial surface of staminodium from whorl IV. A, C–L drawn from the holotype *P. Fiaschi et al. 1319* (SPF); B drawn from the paratype *L. C. S. Assis et al. 1184* (SPF).

Trees to treelets (4–)10–12 m tall; branchlets with shortened internodes, young branchlets gray to brown, densely pubescent to tomentose, rhytidome present, older branchlets gray to brown, glabrous. Leaves with petiole 4–13 × 0.6–1.2 mm; lamina (2.6–)3.2–12.6 × (1–)1.8–3.5 cm, plane, rarely arcuate, narrowly elliptic, base acute to obtuse, apex caudate to slightly caudate, adaxial surface glabrous, venation raised or

flat, abaxial surface glabrous to glabrescent, venation raised or flat, secondary veins in 8 to 12 pairs, at a 30°–80° angle with the primary vein, areoles 0.2–0.6 mm diam., domatia present, rarely absent; cataphylls 1–4 × 1–1.5 mm, abaxial side sparsely to densely pubescent to tomentose. Short shoots bearing the inflorescence (0.8–)1–2(–2.3) cm. Inflorescences 1–3.1 cm, botryoid to thyrsoid, at the axils of cataphylls, stems sparsely pubescent to tomentose. Flowers 4–8 mm; pedicel 1.5–4 mm; receptacle (0.3–)0.5–1 × 0.8–1.3 mm, outer surface sparsely pubescent, inner surface densely pubescent; tepals 2–4 × (0.7–)1–1.5 mm, narrowly elliptic to ovate, adaxial side sparsely to densely papillose, abaxial side glabrescent to sparsely pubescent. Androecium with 9 stamens, whorls I and II 0.9–1.5 mm; filaments 0.4–0.7 mm, sparsely to densely pubescent; anthers 0.5–0.7 × 0.5–0.6 mm, elliptic, oblong, to ovate, sparsely papillose, apex 0.05–0.1 mm, acute, emarginate, obtuse, rounded, to truncate; upper and lower pollen sacs introrse to introrse-latrorse; whorl III 1–1.5 mm; filaments 0.4–0.8 mm, sparsely to densely pubescent; anthers 0.5–0.6 × 0.4–0.6 mm, ovate, oblong, to elliptic, glabrous to sparsely papillose, apex emarginate, rounded, to truncate; upper pollen sacs latrorse to latero-apical, lower pollen sacs extrorse to latero-extrorse; staminodia 3 (whorl IV), 0.5–1 mm, clavate to filiform, or similar to the anthers of whorl III, densely pubescent. Gynoecium with the ovary 0.7–1 mm, ellipsoid; style 0.5–0.7 mm. Cupules 0.4–0.8 × 0.9–1.4 cm, cup-shaped to obconic, margin single, entire after the development of fruits, lenticels rarely present, tepals deciduous; fruits 1–1.3 × 1–1.2 cm, spheroid to obovoid.

Distribution and habitat. *Ocotea ramosissima* is endemic to restinga vegetation in Bahia State, Brazil.

IUCN Red List category. *Ocotea ramosissima* is known from no more than five localities in Bahia State. According to IUCN Red List criteria (IUCN, 2001), the species is considered Vulnerable (VU B1a).

Phenology. *Ocotea ramosissima* has been collected with flowers in February and with fruits from April to July.

Etymology. The specific epithet refers to the many long leafless short shoots bearing the inflorescences.

Relationships. *Ocotea ramosissima* is included in the *O. indecora* group (Assis, 2009) on the basis of the rhythmic growth of the branchlets. Within that group, this new species resembles *O. fasciculata* (Nees) Mez, a widespread species from Amazonia to eastern Brazil and Bolivia that is found in forests, restinga, and campos rupestre vegetation. However, it differs from *O. fasciculata* in having much longer short shoots ([0.8–]1–2.3 cm vs. 0.1–0.5 cm in *O. fasciculata*) bearing the inflorescences and in the spheroid to obovoid (vs. ellipsoid to ovoid) fruits.

Paratypes. BRAZIL. **Bahia**: Cairu, rod. Nilo Peçanha–Cairu, Km 14–18, 29 Apr. 1980 (fr.), *T. S. Santos, L. A. M. Silva & E. B. Santos 3566* (CEPEC, RB); Canavieiras, rod. Canavieiras a Una, estrada vicinal à direta, ca. 14 km de Canavieiras, ca. 3.2 km da entrada da estrada vicinal à direita, Região do Cotovelo, 15°33′25.4″S, 38°58′01.8″W, 9 July 2006 (fr.), *L. C. S. Assis, L. M. Borges & M. Trovó 1184* (B, CEPEC, HBG, K, MO, NY, RB, SPF); Ilhéus, 7.3 km SW of Olivença on rd. to Vila Brazil, 14°59′02″S, 39°02′27″W, 21 May 1995 (fr.), *W. W. Thomas, A. M. Carvalho & G. V. Pitanga 10933* (CEPEC, NY, SPF).

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A New Species of *Clidemia* (Melastomataceae) from Brazil

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Abstract. *Clidemia fluminensis* Baumgratz & D'El Rei Souza (section *Staphidium* (Naudin) Griseb., Melastomataceae, Miconieae), a new species from Rio de Janeiro, Brazil, is described and illustrated. The new taxon occurs in Poço das Antas Biological Reserve in alluvial forest of the Atlantic Forest ecosystem. The new species is distinguished mainly by the scandent habit, membranous leaves, terminal inflorescences, and flowers with yellow petals with an obtuse and apiculate apex. It is related to *C. conglomerata* DC. and *C. involucrata* DC., sharing the glomeruliform inflorescence, the stamen connective not prolonged or appendaged, and the pilose ovary apex.

Key words: Atlantic Forest, Brazil, *Clidemia*, IUCN Red List, Melastomataceae, Miconieae, Rio de Janeiro State, section *Staphidium*.

Clidemia D. Don (Melastomataceae) is a Neotropical, mostly lowland genus consisting of approximately 175 species (Wurdack, 1993) that are widespread in tropical and subtropical areas. In Brazil, there are about 31 species, of which 13 are endemic (Cogniaux, 1888, 1891). It is distributed from Mexico, Central America, and the Antilles into southern Brazil and Argentina, occurring mainly in the Amazon and Atlantic forests. According to Gleason (1939), *C. hirta* (L.) D. Don has been introduced in the Indo-Malaysian region.

Leandra Raddi, *Miconia* Ruiz & Pav., and *Ossaea* DC. are closely related to *Clidemia*, which is recognized mainly by its terminal and/or pseudo-axillary inflorescences, the floral buds with an obtuse to rounded apex, the calyx with bilobate lacinia whose external lobes are equal to or longer than the internal lobes, the petals with an obtuse or rounded apex, and the fleshy, many-seeded fruits of the bacidium type (Baumgratz, 1985).

Recent taxonomic study of the Melastomataceae in the Poço das Antas Biological Reserve in Rio de Janeiro State (Baumgratz et al., 2006), as well as examination of the literature and morphological analysis of herbaria collections, supports the description of a new endemic Brazilian species of *Clidemia*.

The data presented were based on analysis of *Clidemia* collections, along with type photographs available in the herbaria FLOR, GUA, HB, P, R, and RB. All plant material was analyzed using a Wild Leitz M5 stereomicroscope (Wild Heerbrugg, Heerbrugg, Switzerland).

Clidemia fluminensis Baumgratz & D'El Rei Souza, sp. nov. TYPE: Brazil. Rio de Janeiro: Mun. Silva Jardim, Reserva Biol. de Poço das Antas, estrada para Juturnaiba, Km 4, trilha à direita, área do Jacatirão (parcela 2b), 22°32′47.7″S, 42°18′12.6″W, 25 Oct. 2005, *H. C. Lima & A. Pintor 6375* (holotype, RB; isotype, FLOR). Figure 1.

Haec species quoad cymam glomeruliformem, staminum connectivum infra thecas nec productum nec appendiculatum atque ovarium ad apicem pilosum *Clidemiae conglomeratae* DC. et *C. involucratae* DC. affinis, sed ab eis praesertim habitu scandente, lamina foliari membranacea, cymis terminalibus, petalis flavis apice obtuso apiculato, hypanthio longiore, calycis laciniis externis longioribus et antheris longioribus differt.

Climbing shrubs ca. 2 m tall; indumentum vinaceous, branches, leaves, inflorescences, bracts, and prophylls moderately to densely setose, trichomes appressed in the leaves and sparsely glandular-puberulent; branches subterete to terete, at maturity aphyllous and nodose, glabrescent, adventitious roots present. Leaves usually anisomorphic in size in each pair; petiole 0.8–4.5 cm; blade 5.2–10.5 × 3–6 cm, green, discolorous, membranous, narrowly to broadly elliptic, sometimes oblong or ovate, the base obtuse to rounded, the margin crenulate to denticulate, ciliolate, the apex short-acuminate, sometimes rounded short-acuminate; 5-plinerved, the more internal pair of acrodromous veins raised 4–5 mm from the base. Cymes 2–2.5 cm, glomeruliform, terminal, with more than 20 flowers in large-bracted capitate clusters,

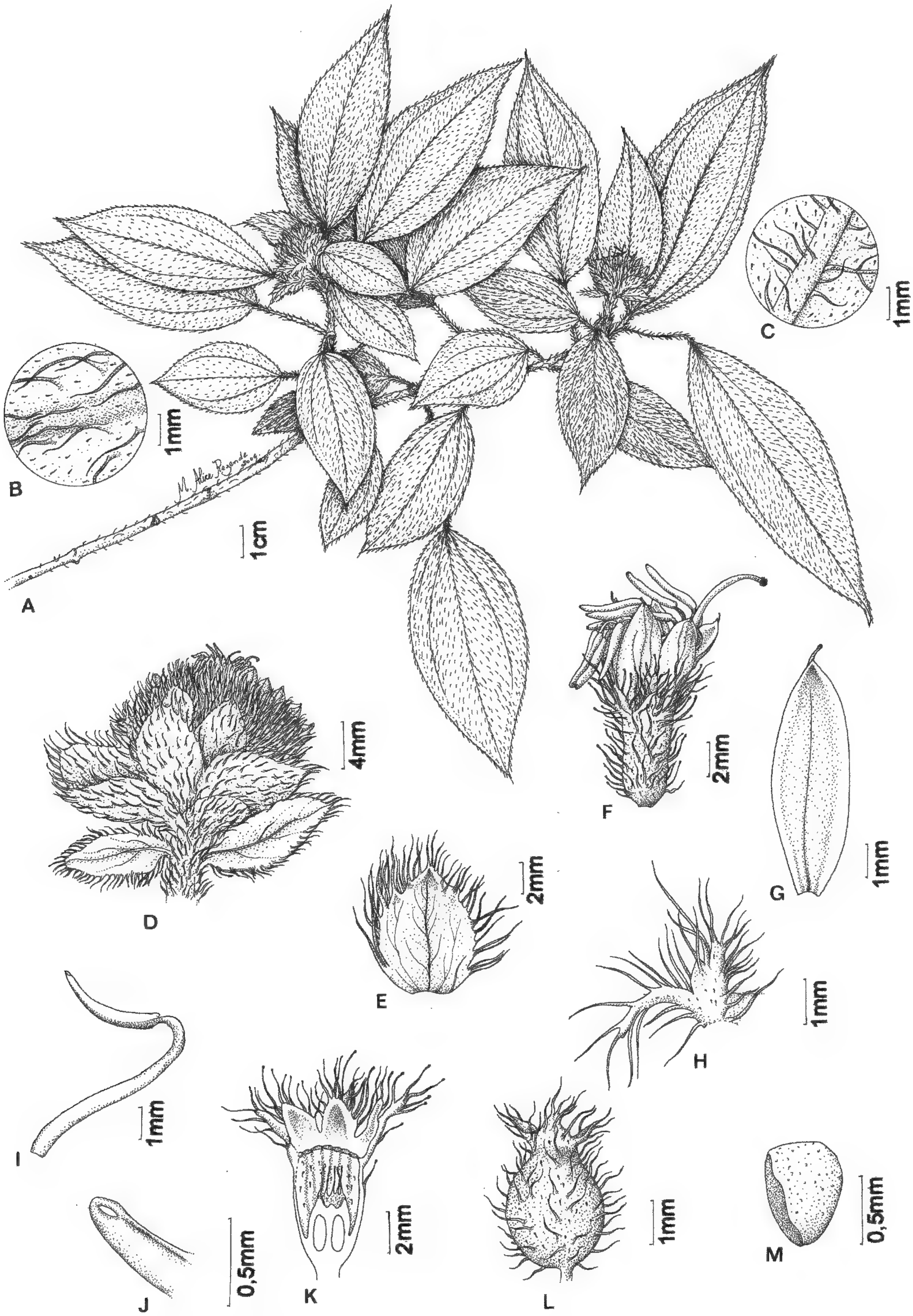

Figure 1. *Clidemia fluminensis* Baumgratz & D'El Rei Souza. —A. Flowering branch. —B, C. Leaf: indument of the adaxial and abaxial surface, respectively. —D. Inflorescence, with the flowers in large-bracted capitate clusters. —E. Bract, adaxial surface. —F. Flower. —G. Petal. —H. Bilobed lacinia of the calyx. —I. Stamen. —J. Anther, ventral pore. —K. Longitudinal section of the flower showing the partial adnation of the hypanthium to the ovary, and the prolonged, glandular-setulose ovary apex. —L. Fruit. —M. Seed. The fertile habit and floral structures (A–K) are drawn from the holotype *Lima & Pintor 6375* (RB); the fruit and seed (L, M) are drawn from the paratype *Luchiari 601* (RB).

peduncle 5–9 mm; bracts 7–7.5 × 5–7 mm, prophylls 4–6 × 1.7–3 mm, both foliaceous, concave, elliptic or broadly elliptic, apex acute to acuminate, apiculate, margin denticulate-ciliate, persistent. Floral buds obtuse; flowers 5-merous; pedicel ca. 0.2 mm; hypanthium and calyx moderately setose and glandular-setose, the glandular head caducous or not; hypanthium 4.5–4.6 × 2.4–2.5 mm, terete; torus thick, glabrous; calyx green, bilobed, persistent, with the tube 0.5–0.6 mm, the lobes erect, reflexed in fruit, the external lobes 2.2–2.5 × 0.4–0.5 mm, thickened, narrowly triangular, apex acute, apiculate, the internal lobes 1.9–2.1 × 0.7–0.8 mm, membranous, oblong to ovate, apex rounded, margin denticulate-ciliolate; petals 5–6.5 × 1.7–2.2 mm, yellow, erect, oblong to elliptic, the apex obtuse, apiculate, with a caducous glandular trichome, glabrous; stamens isomorphic, but unequal in size, filaments 5.5–6.7 mm; anthers 3.5–4.1 mm, yellow, linear, the pore ventral, the connective not prolonged below the thecae, not appendaged; ovary half-inferior, 2.8–3 × 1.5–1.8 mm, 3-locular, the apex prolonged ca. 0.5 mm, glandular-setulose, the glandular head caducous, the style 12–15 mm, glabrous, the stigma capitate. Fruits 7–7.5 × 3.5–4 mm, of bacidium type, dark vinaceous, subglobose, urceolate, many-seeded; seeds 0.6–0.7 × 0.2–0.3 mm, obtriangular to obovate, granular.

Distribution and habitat. *Clidemia fluminensis* is a rare species in the Poço das Antas Reserve, restricted to the alluvial forest in shaded places adjacent to a stream.

IUCN Red List category. Considering that only two collections are available, the samples were collected from the same individual, and only one specimen has been found in the area until now, *Clidemia fluminensis* should be considered Critically Endangered (CR B2ab[i,ii,v]; D) according to IUCN Red List criteria (IUCN, 2001).

Phenology. The new species was collected in flower in October and in fruit in December.

Etymology. The epithet *fluminensis* is taken from a popular name for Rio de Janeiro State.

Discussion. Other *Clidemia* species at the type locality had already been studied (Baumgratz et al., 2006), such as *C. biserrata* DC., *C. capilliflora* (Naudin) Cogn., *C. dentata* D. Don, and *C. hirta* (L.) D. Don. The new species is easily distinguished mainly by its scandent habit, glomeruliform inflorescences with the flowers multiply aggregated in a bracteate head, yellow petals with an obtuse and apiculate apex, and yellow stamens.

Clidemia fluminensis belongs to section *Staphidium* (Naudin) Griseb., based on Cogniaux's works (1888, 1891). This taxonomic assignment is based on the pentamerous flowers, the leaves equal or unequal in size in each pair and similar, the persistent calyx, and the anthers not bilobed at the base.

The new species is most similar to *Clidemia conglomerata* DC. and *C. involucrata* DC. in having flowers disposed in a glomeruliform inflorescence, the stamen connective not prolonged or appendaged, and the pilose ovary apex. Both related species occur in Central America, the Antilles, and northern South America, in Amazonian forests (Cogniaux, 1888, 1891; Wurdack, 1993). They may be distinguished from *C. fluminensis* by their shrubby, nonclimbing habit; chartaceous leaves; axillary inflorescences; flowers with white petals that are rounded at the apex; shorter hypanthia (1.8–2.3 mm); smaller external lobes (0.7–0.9 mm); and shorter anthers (2.6–3 mm). *Clidemia conglomerata* may also be distinguished by the leaves with the basal veins and adaxial blade surface long-strigulose, flowers with a glandular-setulose torus, and 5-celled ovaries. *Clidemia involucrata* further differs by the leaves being 5- to 7-plinerved, the external lobes that project slightly beyond the internal ones, and the shorter petals (ca. 3 mm).

Paratype. BRAZIL. **Rio de Janeiro:** Mun. Silva Jardim, Reserva Biológica de Poço das Antas, ao lado do riacho, 12 Dec. 1994, *C. Luchiari 601* (RB).

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Two New Species of *Cyperus* (Cyperaceae) from the Zambezian Region of Africa

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ABSTRACT. *Cyperus absconditicoronatus* Bauters, Reynders & Goetgh. and *C. unispicatus* Bauters, Reynders & Goetgh., two new species of *Cyperus* L. (Cyperaceae) from Angola and Zambia, are recognized. *Cyperus absconditicoronatus* is a tall species (55–100 cm) characterized by a scaled rhizome, a single terminal capitulum, a ciliated spikelet bract, and deciduous spikelets. *Cyperus unispicatus* can be recognized by a swollen and fibrous stem base growing from slender rhizomes, a single terminal spike, and short involucral bracts. The taxa are described and illustrated, and differences with the closest resembling species are discussed.

Key words: Africa, Angola, Cyperaceae, *Cyperus*, IUCN Red List, Zambia.

The genus *Cyperus* L. s. str. (Cyperaceae) includes 696 accepted species worldwide (Govaerts et al., 2008). *Cyperus* can be recognized by a usually anthelate inflorescence often with conspicuous involucral bracts, spikelets with several to many fertile and usually distichous glumes, the rachilla of the spikelet either persistent or not, the flowers without a perianth, and a trifid, less often bifid, or rarely nondivided style.

During the examination of some specimens of *Cyperus* in the Ghent University Herbarium (GENT) as part of ongoing research on the genus by the authors, several specimens were encountered that could not be assigned to any known species in the genus (after identification with Kükenthal, 1935–1936; Chermezon, 1937; Hooper & Napper, 1972; Haines & Lye, 1983). One of the specimens (*H. & E. Hess 52/545*) was incorrectly identified by Mincier (1984) as *Mariscus albopilosus* C. B. Clarke (accepted name = *Cyperus albopilosus* (C. B. Clarke) Kük.). In his master's thesis on the Cyperaceae from Angola, he mentioned another specimen (*H. & E. Hess 52/262*) as "*Mariscus* sp. nov." (Mincier, 1984: 180). Both specimens clearly belong to the same new species. In the herbarium of the National Botanic Garden of Belgium (BR), a third specimen (*M. G. Bingham 7042/2*) of this taxon was found, incorrectly identified as *C. rhynchosporoides* Kük.

Mincier (1984: 182) also mentioned the only known specimen (*H. & E. Hess 52/34*) of the second new species, *Cyperus unispicatus* Bauters, Reynders & Goetgh., as "*Mariscus* sp. nov." He placed this new species in *Cyperus* sect. *Bulbocaules* (C. B. Clarke) Kük., which is characterized by a swollen stem base.

1. Cyperus absconditicoronatus Bauters, Reynders & Goetgh., sp. nov. TYPE: Angola. Bié: Falls of Cutato River, S of [Kuvango]–Cuchi Rd., 15 Sep. 1952, *H. & E. Hess 52/262* (holotype, GENT). Figures 1, 2A, B.

Haec species *Cypero rhynchosporoidi* Kük. et *C. albopiloso* (C. B. Clarke) Kük. similis, sed a hoc bracteis involucralibus 3, inflorescentia majore atque nucula oblonga, ab illo habitu robustiore atque culmo ad basim non incrassato distinguitur.

Perennial herb; rhizomes 6–9 mm thick, with conspicuous red-brown scales that split crown-like as the rhizome thickens; culms 55–100 × ca. 0.2 cm, slender, triangular, erect, ciliated with hairs on the ribs, scabrous, stem base not swollen. Leaves 5 to 8, all basal, lowest leaves reduced to their sheath; sheaths to 13 cm, cinnamon colored; highest leaves with blades; blades rough, 35–65 × 0.5–0.7 cm. Inflorescence a single, terminal, spherical head, 1.5–1.6 cm diam.; involucral bracts 3, ciliated on the edges, 2.5–9.5 × 0.3–0.4 cm. Spikelets deciduous, 5–8 × 1–1.2 mm; spikelet bract 2–3 × ca. 1 mm (measured on folded bract), ciliated on the midrib; spikelet prophyll 2–3 × ca. 1 mm (measured on folded prophyll); glumes 2 per spikelet, distichous; first glume completely enveloping nutlet, 5–8 mm long, 12-veined; second glume strongly reduced, 3.5–4 × ca. 0.8 mm, midrib white. Flowers 1 per spikelet, bisexual; stamens 3, anthers ca. 7 mm; style 1–2 mm; stigma branches 3. Nutlet 5–6 × ca. 1 mm, oblong, trigonous, apiculate, black.

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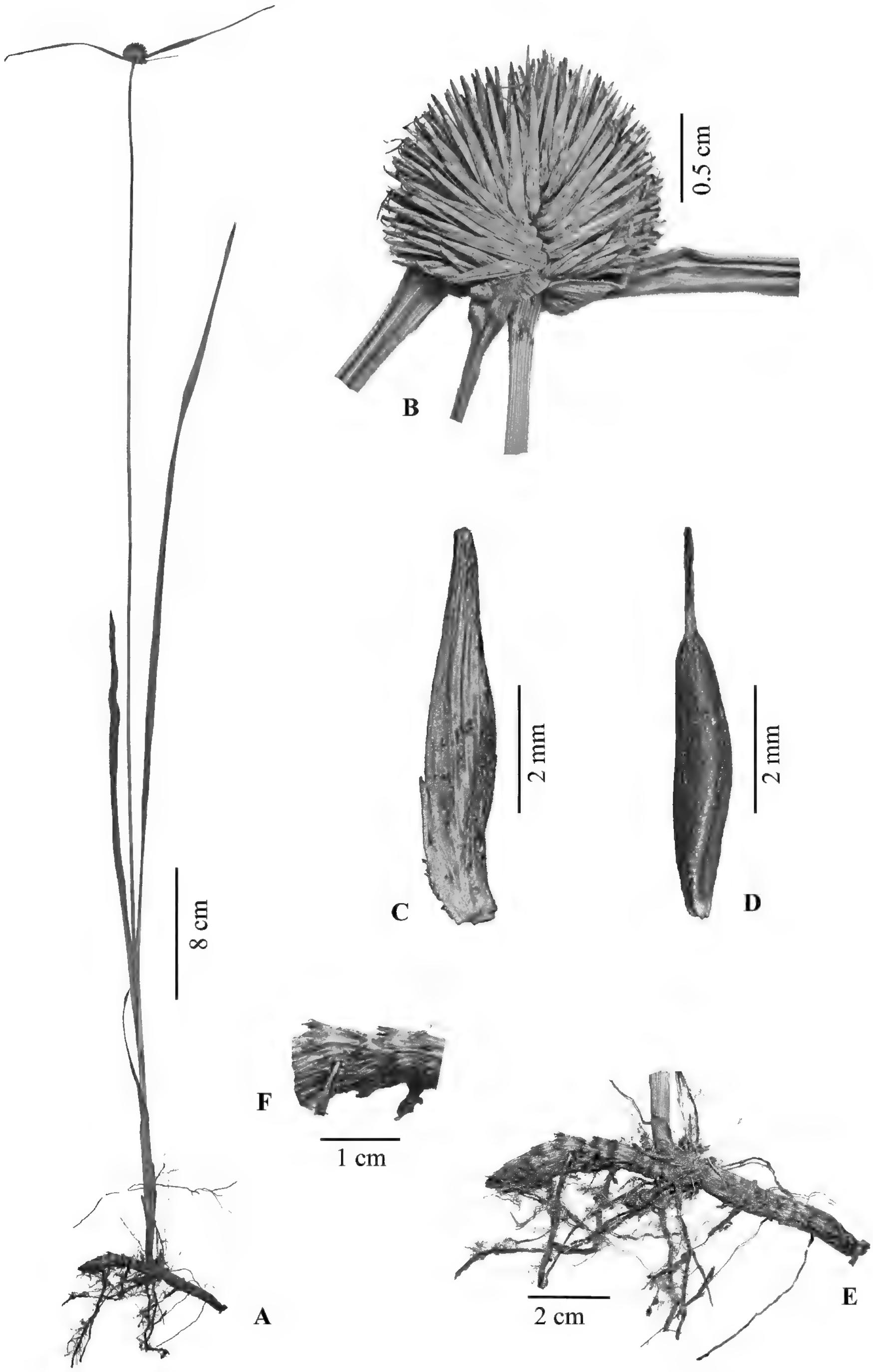

Figure 1. *Cyperus absconditicoronatus* Bauters, Reynders & Goetgh. —A. Habit. —B. Inflorescence. —C. Spikelet. —D. Nutlet. —E. Rhizome. —F. Detail of rhizome scales. From the holotype *H. & E. Hess 52/262* (GENT).

IUCN Red List category. *Cyperus absconditicoronatus* should be classified as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Etymology. The epithet of *Cyperus absconditicoronatus* means "with hidden crown" and refers to the scales of the rhizome, which split crown-like.

Table 1. Morphological comparison of *Cyperus absconditicoronatus*, *C. rhynchosporoides*, *C. unispicatus*, and *C. stramineoferrugineus*.

	C. absconditicoronatus	*C. rhynchosporoides*	*C. unispicatus*	*C. stramineoferrugineus*
Basal parts	rhizomes, 6–9 mm thick	rhizomes, 3 mm thick	slender rhizome	caespitose
Culm base	not swollen	slightly swollen	swollen: 0.5–0.9 cm	swollen: 0.9–1.3 cm
Culms, dimensions (cm)	55–100 × ca. 0.2	10–50 × 0.1–0.2	(9–)20–32 × 0.05–0.1	10–15 × 0.05–0.1
Culms, section	triangular	triangular to rounded	triangular	triangular, slightly compressed
Leaf blade, dimensions (cm)	35–65 × 0.5–0.7	ca. 30 × 0.3–0.5	(2–)5–14 × 0.1–0.2	5–15 × 0.03–0.1
Inflorescence	spherical capitulum	spherical capitulum	ovate capitulum	spherical capitulum
Capitulum, diam. (cm)	1.5–1.6	ca. 1	0.4–0.7	0.6–1
Involucral bracts	3	2 to 4	1 to 2	2 to 3
Involucral bracts, length (cm)	2.5–9.5	3–6	0.7–1.6	3–5
Spikelets	2 glumes, 1 flower	2 glumes, 2 flowers	3 flowers	4 to 5 flowers
Spikelets, dimensions (mm)	5–8 × 1–1.2	5–6 × ca. 1	2–3.6 × ca. 1	3–5 × ca. 2
Glumes, length (mm)	5–8	4.5–5	1.5–2.5	3.5–4
Spikelet bracts	ciliated on midrib	not ciliated on midrib	not ciliated on midrib	NA
Nutlet, dimensions (mm)	5–6 × ca. 1	NA	1.1–1.3 × 0.5–0.8	1.5–1.8 × 1–1.2
Distribution	Angola, Zambia	Angola, Zambia, Congo	Angola	Tanzania

NA, data not available.

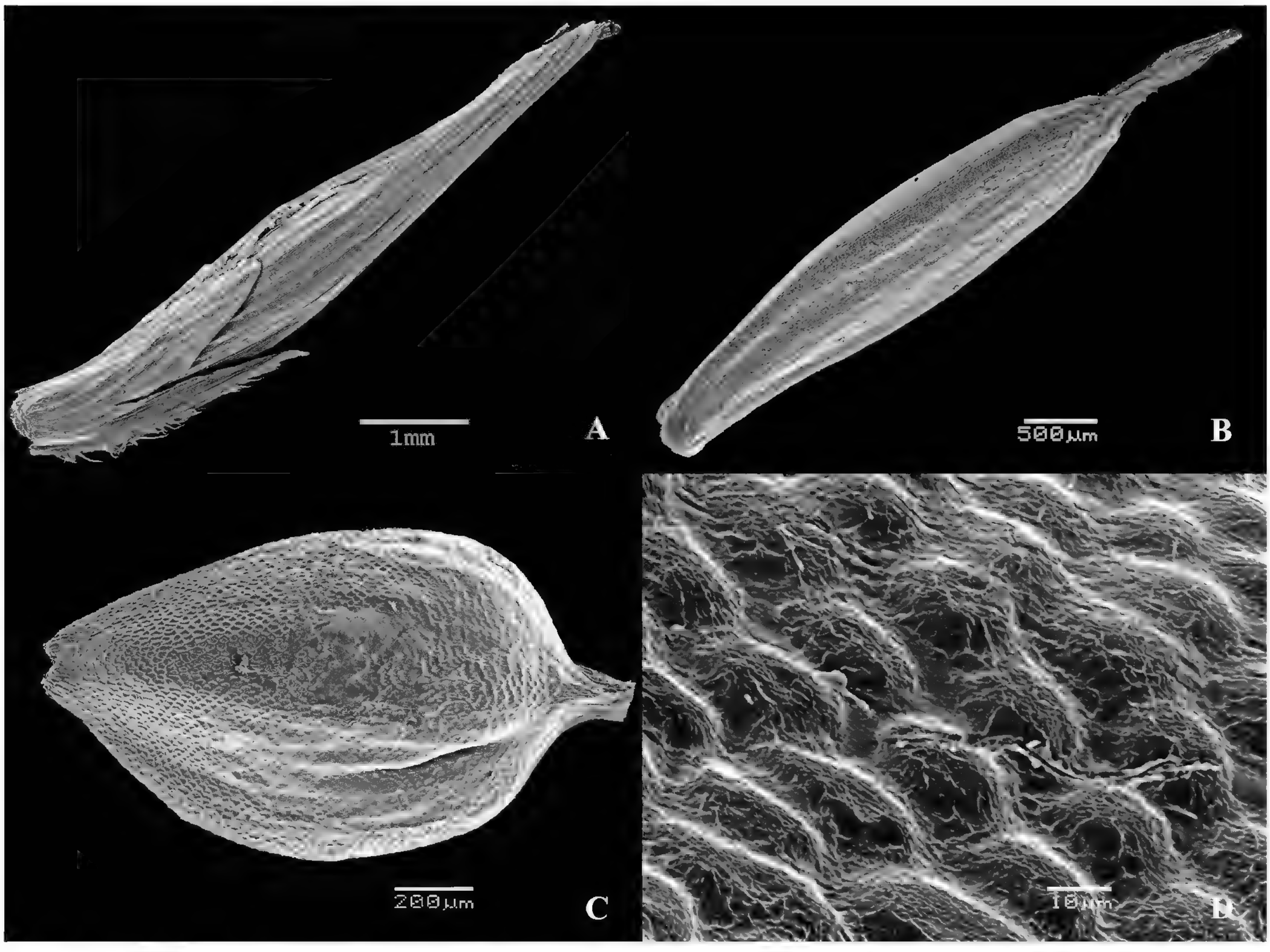

Figure 2. A, B. SEM micrographs of *Cyperus absconditicoronatus* Bauters, Reynders & Goetgh. —A. Spikelet. —B. Nutlet. C, D. SEM micrographs of *C. unispicatus* Bauters, Reynders & Goetgh. —C. Nutlet. —D. Nutlet epidermal cells.

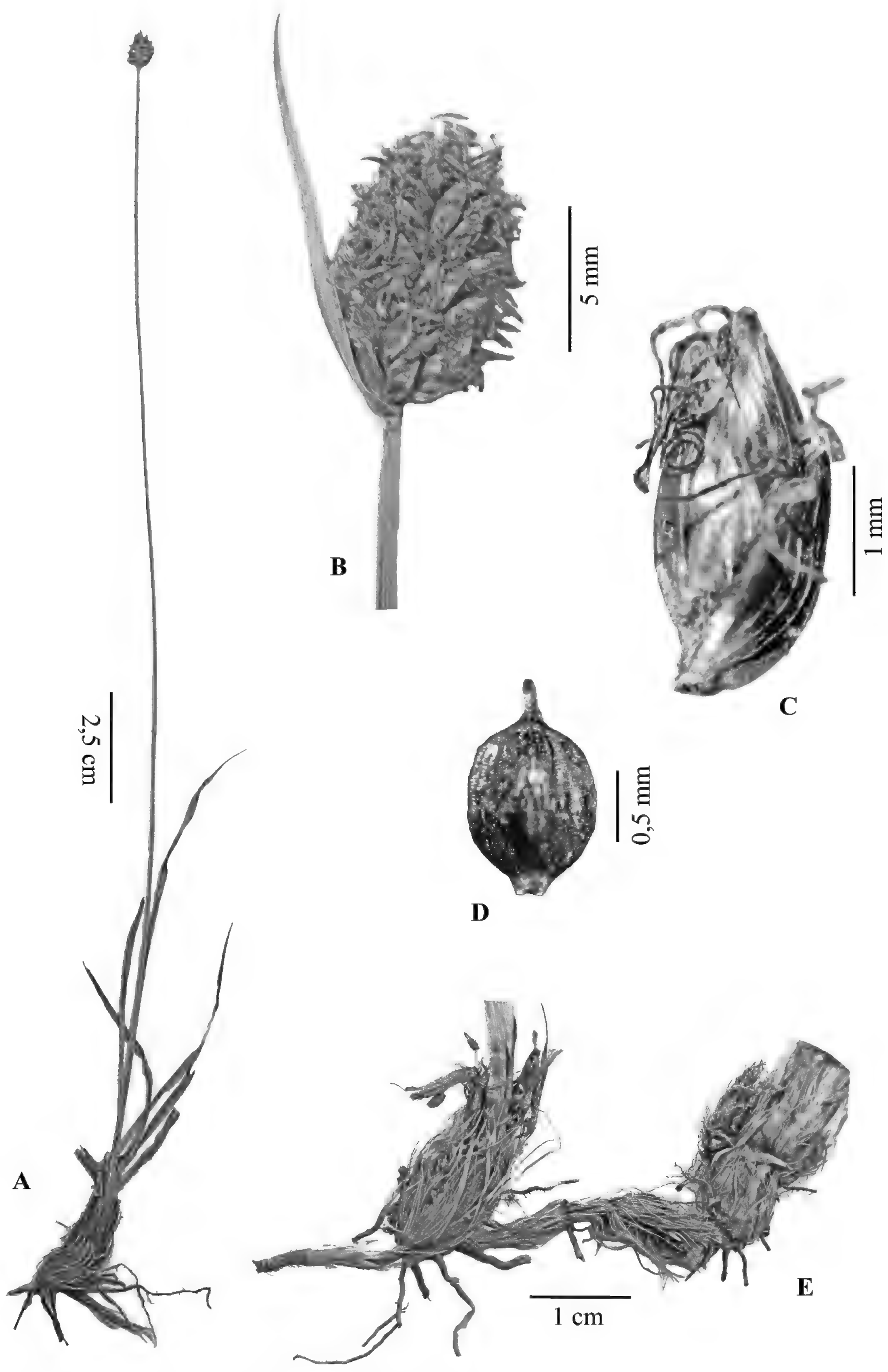

Figure 3. *Cyperus unispicatus* Bauters, Reynders & Goetgh. —A. Habit. —B. Inflorescence. —C. Spikelet. —D. Nutlet. —E. Plant bases. From the holotype *H. & E. Hess 52/34* (GENT).

Relationships. *Cyperus absconditicoronatus* is a tall species characterized by a distinctly scaled rhizome, deciduous spikelets, and a ciliated spikelet bract. The closest resemblance was found in the species *C. rhynchosporoides*, the type of *Cyperus* sect. *Ochrocephali* Kük. (Kükenthal, 1935–1936). However, *C. rhynchosporoides* is much smaller in all aspects and has a slightly swollen stem base (Table 1). As

mentioned, Mincier (1984) identified one of the specimens of *C. absconditicoronatus* as *C. albopilosus*. However, *C. albopilosus* has a much smaller capitate inflorescence, an ovate nutlet, and only two involucral bracts.

Paratypes. ANGOLA. **Bié:** Baixo [Kuvango], 30 km N of Caiundo, N of Mission Capico, 1200 m, 31 Jan. 1952, *H. & E. Hess 52/545* (GENT). ZAMBIA. **North-Western Province:** Mwinilunga Distr., Wanyizenzi, 7 Jan. 1991, *M. G. Bingham 7042/2* (BR).

2. Cyperus unispicatus Bauters, Reynders & Goetgh., sp. nov. TYPE: Angola. Huíla: near Mupa Catholic Mission in Cuanhama, 228 km S of [Kuvango], 1250 m, 9 Sep. 1952, *H. & E. Hess 52/34* (holotype, GENT). Figures 2C, D, 3.

Haec species *Cypero stramineoferrugineo* Kük. similis, sed ab eo culmo altiore, inflorescentia densiore atque spiculis 3-floris distinguitur.

Perennial herb, forming slender rhizomes; rhizomes dark brown, 15–30 × 1–1.5 mm; stem base swollen, 5–9 mm wide, covered in fibrous remains of old leaf sheaths; culms (9–)20–32 × 0.05–0.1 cm, slender, triangular, glabrous. Leaves 5 to 9, all basal, sheaths up to 4 cm long, blades (2–)5–14 × 0.1–0.2 cm, ciliated on the edges and midrib. Inflorescence a single terminal capitate spike, slightly pseudolateral by its involucral bract; spike ovate, 4–7 × (0.5–)0.9–1 mm; involucral bracts 1 or 2, largest 0.7–1.6 × 0.07–0.1 cm, second involucral bract strongly reduced. Spikelets deciduous but bract and prophyll persistent, 2–3.6 × ca. 1 mm; glumes 1.5–2.5 × ca. 1 mm, distichous. Flowers 3 per spikelet; stamens 3; style branches 3. Nutlet obovate, 1.1–1.3 × 0.5–0.8 mm, triangular, apiculate.

IUCN Red List category. Cyperus unispicatus should be classified as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Etymology. The epithet of *Cyperus unispicatus* means "with one spike" and refers to the single terminal spike.

Relationships. Cyperus unispicatus is characterized by a swollen stem base on a slender rhizome and a single terminal spike with short involucral bracts. *Cyperus unispicatus* most closely resembles *C. stramineoferrugineus* Kük. (Kükenthal, 1935–1936; Haines & Lye, 1983). However, the latter species has a less dense, capitate inflorescence, a shorter culm, and spikelets with four to five flowers (Table 1). Based on its morphology, *C. unispicatus* could be classified in *Cyperus* sect. *Bulbocaules* subsect. *Kyllingiformes* Kük. This group consists of perennial herbs with triangular, glabrous (seldom hairy) culms. The stem base is swollen and covered with the sometimes fibrous remains of old leaf sheaths. Most species have thick rhizomes, although some have stolons (*C. chevalieri* Kük.). The inflorescence always consists of a dense spherical or irregular capitulum. The deciduous spikelets are elliptical to lanceolate with one to six flowers.

Discussion. Cyperus absconditicoronatus and *C. unispicatus* are both found in miombo woodlands in the Zambezian region of Africa. Although only known from a few localities, the new species are potentially present throughout this still poorly known ecoregion, which ranges from Angola to the shores of Lake Victoria in Tanzania.

Both species are characterized by deciduous spikelets and a head-like contracted inflorescence. In addition, *Cyperus absconditicoronatus* has spikelets on which only one nutlet matures. This combination of characters can be found in various lineages within *Cyperus* (especially in the chlorocyperoid clade) such as *Cyperus* sect. *Bulbocaules*, *Cyperus* sect. *Ochrocephali*, *Kyllinga* Rottb., *Lipocarpha* R. Br., and *Ascolepis* Nees ex Steud. Homologies of the inflorescences of these taxa are still unclear due to the unresolved phylogeny of the *Cyperus* clade with chlorocyperoid anatomy to which these species belong. It is thus premature to place the two new species in any of the known subdivisions, and further study with additional molecular markers is needed to reveal the exact position of the new species. Nevertheless, the two new species can be easily distinguished from all other *Cyperus* species based on morphological evidence.

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New Combinations and One New Name for the Moss Genus *Taxithelium* (Pylaisiadelphaceae)

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Abstract. During the taxonomic revision of *Taxithelium* Spruce ex Mitt. (Pylaisiadelphaceae), species previously treated in the genus are excluded, and eight new combinations are presented here: *Camptochaete novae-zeelandiae* (E. B. Bartram & Dixon) P. E. A. S. Câmara, *Chaetomitrium spuriosubtile* (Broth.) P. E. A. S. Câmara, *Phyllodon bilobatus* (Dixon) P. E. A. S. Câmara, *P. choiropyxis* (Müll. Hal.) P. E. A. S. Câmara, *P. glossoides* (Bosch & Sande Lac.) P. E. A. S. Câmara, *Sematophyllum borneense* (Broth.) P. E. A. S. Câmara, *S. mundulum* (Sull.) P. E. A. S. Câmara, and *Trichosteleum friedense* (D. H. Norris & T. J. Kop.) P. E. A. S. Câmara. The new name *Sematophyllum laevigatum* P. E. A. S. Câmara is proposed for *Hypnum trachaelocarpum* Angstr. Lectotypifications are also provided for *Sigmatella choiropyxis* Müll. Hal. and *Hypnum trachaelocarpum* Ångstr.

Key words: Hypnaceae, *Phyllodon*, Pylaisiadelphaceae, Sematophyllaceae, *Sematophyllum*, *Taxithelium*, *Trichosteleum*.

The genus *Taxithelium* Spruce ex Mitt. was first described by Mitten (1869) in tribe Sematophylleae. Later, Brotherus (1925) assigned the genus to the family Sematophyllaceae, but much controversy has arisen on this familiar placement due to the lack of sematophyllaceous characters in the genus such as the collenchymatous exothecial cells, long rostrate opercula, and well-developed, often inflated alar cells (Seki, 1969; Hedenäs, 1996; Tan & Jia, 1998; Hedenäs & Buck, 1999). The molecular phylogenetic works of Tsubota et al. (2001a, b) have demonstrated that *Taxithelium* is not closely related to the core Sematophyllaceae (*Sematophyllum* Mitt., *Trichosteleum* Mitt., and *Acroporium* Mitt.), but is more closely related to *Pylaisiadelpha* Cardot, *Isopterygium* Mitt., and *Brotherella* Loeske ex M. Fleisch. Therefore, Goffinet and Buck (2004) transferred the genus *Taxithelium* into a newly described family, Pylaisiadelphaceae. Unfortunately, this family was described on the basis of absence of characters (as stated in the original description: "Sematophyllaceis affine, cellulis exothecii non collenchymatosis celluli alaribus parviore plerumque non inflates pseudoparaphyllis saepe filamentosis differt"; Goffinet & Buck, 2004), that is, as a family that lacks the typical features of Sematophyllaceae. Those absences associated *Taxithelium* more with the Pylaisiadelphaceae than with the Sematophyllaceae.

Taxithelium is a pantropical genus occurring mainly in Southeast Asia between 30°N and 20°S. The genus is currently under taxonomic revision by this author, and it has been suggested to be monophyletic by the ongoing work by Câmara and Shaw (unpublished). It is characterized by the presence in the gametophyte of multiple papillae serially disposed over the lumina of leaf cells (a rare character present only in one other genus within Sematophyllaceae: *Radulina* W. R. Buck & B. C. Tan). *Taxithelium* also has a poorly developed alar region, and the sporophytes lack collenchymatous exothecial cells and have a short-rostrate opercula. *Taxithelium* can be easily differentiated from *Radulina* due to the presence in the latter of a well-developed alar region, long rostrate opercula, and collenchymatous exothecial cells.

Eight new combinations are presented here to allow proper recircumscription of the genus. These taxa all lack pluripapillose leaf cells, which is a diagnostic character for *Taxithelium*. This observation is addressed in more detail in the SEM studies by Câmara and Kellogg (2010).

I. Camptochaete Reichardt, Reise Novara 1(3): 190. 1870. TYPE: *Hookeria arbuscula* J. E. Smith.

The genus was revised by Tangney (1997) as a group of 11 species. It occurs in Indonesia, Papua New Guinea, New Caledonia, Vanuatu, Fiji, Australia, and New Zealand.

1. Camptochaete novae-zeelandiae (E. B. Bartram & Dixon) P. E. A. S. Câmara, comb. nov. Basionym: *Taxithelium novae-zeelandiae* E. B. Bartram & Dixon, Bot. Not. 83: 7. 1937. TYPE: New Zealand. Wellington, 1874, *S. Bergren s.n.* (holotype, BM).

The lack of papillae, cell shape, size of leaves, and spiral phyllotaxy in this species do not conform to the

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current circumscription of *Taxithelium*. Sainsbury (1955) suggested this species to be a synonym of *Camptochaete gracilis* (Hook. f. & Wilson) Paris. Later, Damanhuri and Longton (1996) agreed with the exclusion of this taxon from *Taxithelium*, but provided no new combination or further evidence. A closer look at the type specimen, as well as additional specimens from MO, associates it with the genus *Camptochaete* (Lembophyllaceae) on the basis of the presence of a glossy and scariose leaf with a falcate-secund arrangement, leaf shape, and the presence of a single leaf papilla per cell. However, examination of herbarium specimens shows that it is not conspecific (as suggested above by Sainsbury) with *C. gracilis*.

II. Chaetomitrium Dozy & Molk., Musci Frond. Ined. Archip. Ind. 117. 1846. TYPE: *Hookeria elongata* Dozy & Molk.

This Southeast Asian genus belongs to the Hookeriaceae (Goffinet & Buck, 2004). Akiyama and Suleiman (2001) studied the genus for Borneo as did Streimann (1997) for Australia. The Philippine species has not yet been investigated and is considered here.

1. Chaetomitrium spuriosubtile (Broth.) P. E. A. S. Câmara, comb. nov. Basionym: *Taxithelium spuriosubtile* Broth., Philipp. J. Sci. 5: 160. 1910. TYPE: Philippines. Luzon: Lepanto, Mt. Data, 1910, *For. Bur., Bacani 16016* (holotype, H; isotypes, BM, FH, JE, L, NY, PC, PNH, US).

This small taxon (ca. 0.3 mm) is known only from the type collection; it has a single papilla over the cell lumen, and the leaf margins are serrulate and have a poorly developed alar region. It is clearly not a species of *Taxithelium*, which is characterized by pluripapillose leaf cells. Damanhuri and Longton (1994), who studied the genus *Taxithelium* worldwide, stated that this taxon did not belong in *Taxithelium*, but they had no idea where it would belong and even encouraged suggestions.

Generic placement is difficult as there are, to my knowledge, very few genera that would fit with this plant's features, and there is no DNA available to help access phylogenetic information. However, the taxon resembles the genus *Chaetomitrium* in the oblong leaf shape, the near absence of alar cells, the presence of a single leaf papilla, and the similar serrulate margin. Even though the papillation pattern seen in this taxon is not typical of *Chaetomitrium*, Akiyama and Suleiman (2001: 493) have stated that the papillation pattern in *Chaetomitrium* is highly variable and one should not rely on "this feature alone in distinguishing any taxa in the genus."

Although the type specimen (*For. Bur., Bacani 16016*) is much smaller than *Chaetomitrium* (which can range from 0.6–1 mm), according to Akiyama and Suleiman (2001) the genus is highly variable in shape and size, which lends support to this taxon being a local variation of *Chaetomitrium*. Therefore, I have provisionally placed this taxon in *Chaetomitrium* as the best fit based on current evidence.

III. Phyllodon Bruch & Schimp., Bryol. Eur. 5: 60. 1851. TYPE: *Hookeria retusa* Wilson.

The following three taxa share a truncate leaf apex, serrulate blade margins, and costae that are strongly visible and double, all characteristics of the pantropical genus *Phyllodon*. Furthermore, the presence of a single leaf papilla and an undeveloped alar region provides strong support for their transfer to *Phyllodon*. Buck (1987) studied the Asiatic species (4), Kis (2002) the African ones (6), and Higuchi and Nishimura (2002) those distributed in the Pacific islands.

1. Phyllodon bilobatus (Dixon) P. E. A. S. Câmara, comb. nov. Basionym: *Taxithelium bilobatum* Dixon, Bull. Torrey Bot. Club 51: 244. 1924. *Glossadelphus bilobatus* (Dixon) Broth., Nat. Pflanzenfam., ed. 2, 11: 535. 1925. TYPE: Malaysia. Bujong Malacca: Perak, s.d., *Ridley 739* (holotype, BM; isotype, NY).

2. Phyllodon choiropyxis (Müll. Hal.) P. E. A. S. Câmara, comb. nov. Basionym: *Sigmatella choiropyxis* Müll. Hal., Hedwigia 40: 69. 1901. *Taxithelium choiropyxis* (Müll. Hal.) Renauld & Cardot, Rev. Bryol. 28: 111. 1901. TYPE: Brazil. São Paulo: Iporanga, 1879, *Puiggari s.n.* (lectotype, designated here, FH).

The holotype was presumed destroyed during World War II, when the Berlin herbarium was bombed. Unfortunately, most of the Müller Hallensis collections hosted there are lost forever. After studying more than 6000 plants on loan from 23 herbaria, the only extant type collection I have located is *Puiggari s.n.* (FH), which is likely an isotype from the original collection, and I therefore assign it as lectotype here.

3. Phyllodon glossoides (Bosch & Sande Lac.) P. E. A. S. Câmara, comb. nov. Basionym: *Hypnum glossoides* Bosch & Sande Lac., Bryol. Jav. 2: 146. 243. 1866. *Trichosteleum glossoides* (Bosch & Sande Lac.) Geh., Rev. Bryol. 21: 85. 1894. *Taxithelium glossoides* (Bosch & Sande Lac.) M. Fleisch., Nat. Pflanzenfam. 3: 1093. 1908.

Glossadelphus glossoides (Bosch & Sande Lac.) M. Fleisch., Musci Buitenzorg 4: 1358. 1923. TYPE: Indonesia. Java, s.d., *Teysmann s.n.* (holotype, L not seen; isotype, H).

IV. Sematophyllum Mitt., J. Linn. Soc., Bot. 8: 5. 1865. TYPE: *Hypnum demissum* Wilson.

The following three taxa all have diagnostic features of the core Sematophyllaceae, such as the long linear laminal cells, collenchymatous exothecial cells, long rostrate opercula, and an absence of costae. In addition, they lack any leaf papillae and present a well-developed alar region with oblong leaves. Furthermore, the lack of furrowed exostome leaves little doubt of the affinity of these specimens with the pantropical (and not yet revised) genus *Sematophyllum*.

1. **Sematophyllum borneense** (Broth.) P. E. A. S. Câmara, comb. nov. Basionym: *Taxithelium borneense* Broth., Mitt. Inst. Allg. Bot. Hamburg 7(2): 135. 1928. TYPE: West-Borneo [Indonesia]. Kalimantan: Sambas, s.d., *Micholitz s.n.* (holotype, H).

2. **Sematophyllum laevigatum** P. E. A. S. Câmara, nom. nov. Replaced name: *Hypnum trachaelocarpum* Ångstr., Öfvers. Förh. Kongl. Svenska Vetensk.-Akad. 30(5): 127. 1873. *Trichosteleum trachaelocarpum* (Ångstr.) A. Jaeger, Ber. Thätigk. St. Gallischen Naturwiss. Ges. 1876–77: 413. 1878. *Rhaphidostegium trachaelocarpum* (Ångstr.) Besch. Ann. Sci. Nat. Bot., sér. 7, 50. 1894, nom. illeg., non *Rhaphidostegium trachaelocarpum* Kindb., 1891. [= *Sematophyllum trachaelocarpum* (Kindb.) Broth., 1925]. *Taxithelium trachaelocarpum* (Ångstr.) Broth., Nat. Pflanzenfam. 3: 1091. 1908. TYPE: Tahiti. s. loc., s.d., *Anderson s.n.* (lectotype, designated here, H; isotype, L).

In making the new combination within *Sematophyllum*, we found that the epithet was in use for *S. trachaelocarpum* (Kindb.) Broth., and therefore a new name was needed. The new epithet *laevigatum* refers to the smooth surface of the leaf cells.

In the absence of a holotype, I have selected *Anderson s.n.* as the lectotype, and choose the specimen at H as the most representative specimen.

3. **Sematophyllum mundulum** (Sull.) P. E. A. S. Câmara, comb. nov. Basionym: *Hypnum mundulum* Sull., Proc. Amer. Acad. Arts 3: 75. 1854. *Taxithelium mundulum* (Sull.) E. B. Bartram, Bernice P. Bishop Mus. Bull. 101: 238. 176. 1933. TYPE: Hawaii. Puna, s.d., *Wilkes Expedition s.n.* (holotype, FH).

V. Trichosteleum Mitt., J. Linn. Soc., Bot. 10: 181. 1868. TYPE: *Trichosteleum fissum* Mitt.

The following taxa have diagnostic features of the core Sematophyllaceae, such as the well-developed alar cells, long linear laminal cells, long rostrate opercula, collenchymatous exothecial cells, and an absence of costae. In addition, they present unipapillose leaf cells. This combination of features associates this plant with *Trichosteleum*, a genus that has not yet been revised and is present virtually worldwide within the tropics.

1. **Trichosteleum friedense** (D. H. Norris & T. J. Kop.) P. E. A. S. Câmara, comb. nov. Basionym: *Taxithelium friedense* D. H. Norris & T. J. Kop., Ann. Bot. Fenn. 22: 383. 1985. TYPE: Papua New Guinea. West Sepik: Frieda River, *Koponen 35136* (holotype, H; isotypes, HSC not seen, L, LAE not seen, NICH, NY, PC).

This interesting plant is only known from the type collections. In the original description, the authors stated that the papillae were difficult to see, but were visible at the leaf margins. They also concluded that this plant had a pluripapillose pattern (Norris & Koponen, 1985).

Studying the type specimens with both light and electron microscopy, I was able to see only a single papilla per cell (Fig. 1), and some cells lacked any papillae. Papillae are present in the leaf margins, but again only one per cell. The papillae seen are conically shaped as described in the Sematophyllaceae by Câmara and Kellogg (2010).

The presence of linear leaf cells with a developed alar region clearly associates this genus with the Sematophyllaceae. Only a few genera in this family have unipapillose cells: *Trichosteleum*, *Papillidiopsis* (Broth.) W. R. Buck & B. C. Tan, *Acanthorrhynchium* M. Fleisch., *Warburgiella* Müll. Hal. ex Broth., and some species of *Acroporium* and *Wijkia* H. A. Crum. The absence of inwardly curved alar cells distinguishes this taxon from *Acroporium*, and the absence of concave leaves with abruptly constricted apices distinguishes it from *Papillidiopsis*. It can be distinguished from both *Wijkia* and *Papillidiopsis* by the absence of flagelliform branches, and the presence of collenchymatous exothecial cells separates it from *Warburgiella* and *Acanthorrhynchium*. Consequently, I transfer it into *Trichosteleum* here.

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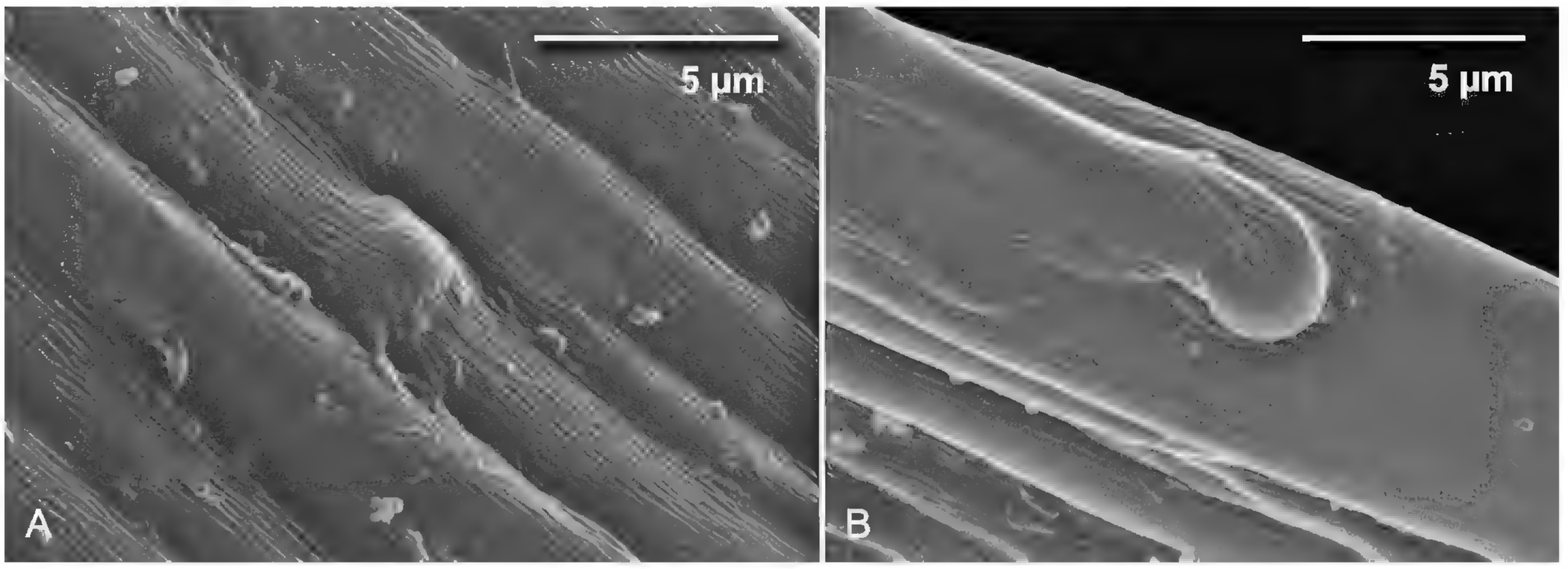

Figure 1. Leaf cells of *Trichosteleum friedense*. —A. SEM image showing the presence of single papilla over the lumen of some cells. —B. SEM image showing the single marginal papilla cited by Norris and Koponen (1985).

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Strobilanthes ovata (Acanthaceae), a New Species from Gaoligong Shan in Yunnan, China

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ABSTRACT. A new species, *Strobilanthes ovata* Y. F. Deng & J. R. I. Wood (Acanthaceae), is described and illustrated. The new species is another endemic species from Gaoligong Shan in southwest Yunnan similar to *S. decipiens* J. R. I. Wood, but differs in its glabrous leaves, winged rachis, the distant, spicate flowers, and the ovate, oblong-ovate, or rounded bracts.

Key words: Acanthaceae, China, IUCN Red List, *Strobilanthes*.

Gaoligong Shan is a 600-km-long, high-elevation mountain range that straddles the border between Yunnan Province in China and Kachin State in Burma (Myanmar) over much of its length. This range is situated at the heart of a vast biodiversity hotspot under severe threat of destruction through human activity (Li et al., 2000; Myers et al., 2000; Stotz et al., 2003; Chaplin, 2005; Liu & Kress, 2005). In the past 10 years, a biodiversity survey in the Gaoligong Shan was conducted jointly by the Kunming Institute of Botany, Chinese Academy of Sciences (KUN), and the California Academy of Sciences (CAS) to study the flora of this area. More than 30,000 collections were made and several new species were found (Yi & Li, 2001; Li & Li, 2002; Wang, 2008; Li & Hu, 2009). Among them, two new species of *Strobilanthes* Blume, *S. lihengiae* Y. F. Deng & J. R. I. Wood and *S. euantha* J. R. I. Wood, have been described by us (Wood et al., 2003a; Deng et al., 2006). In the course of identifying specimens of Acanthaceae from Gaoligong Shan, we found another new species of *Strobilanthes* characterized by its winged inflorescence rachis and ovate inflorescence bracts. The new species is described and illustrated below.

Strobilanthes ovata Y. F. Deng & J. R. I. Wood, sp. nov. TYPE: China. Yunnan: Baoshan Shi, Longyang Qu, Lihuipo, summit of Gaoligong Shan, 2100 m, 17 Nov. 2000, *Li Heng with Dao Zhilin & Yin Liwei 13101* (holotype, KUN; isotype, CAS). Figure 1.

Species nova *Strobilanthis decipientis* J. R. I. Wood affinis, sed ab ea foliis glabris, floribus distantibus in rhachim alatam dispositis, bracteis ovatis oblongo-ovatis vel orbiculatis et bracteolis oblanceolatis differt.

Perennial herb, 30–40 cm tall; *stems* with a narrow wing up to 0.75 mm wide on each side, glabrous, densely covered with cystoliths. *Leaves* petiolate near the base, becoming sessile apically; petioles of lower leaves 3–5 mm, glabrous; blades of lower leaves 2–5 × 1–2 cm, ovate-elliptic, glabrous, apex acuminate, margin crenate to crenate-serrate, base decurrent; blades of upper leaves 2–3 × 1.2–2.3 cm, cordate, glabrous, apex acuminate, base cordate, margin crenate to crenate-serrate; all leaf blades with cystoliths prominent on both surfaces, paler abaxially with prominent veins covered by cystoliths, lateral veins in 2 to 4 pairs. *Inflorescence* of spikes terminal on main stem or on branches arising from the uppermost leaf axils, 1–7 cm; rachis narrowly winged, pilose with multicellular hairs, some gland-tipped; *bracts* ovate, oblong-ovate, or rounded, 3–7 × 1–5 mm, pubescent; *bracteoles* oblanceolate, ca. 5 × 1 mm, apex rounded, subglabrous to pilose with multicellular hairs, some gland-tipped; *calyx* subglabrous when immature, becoming glandular-pilose on the margin, weakly 2-lipped, the upper lip 8–10 mm, 3-lobed, lobes triangular, 5–7 mm, connate for ca. 3 mm above base,

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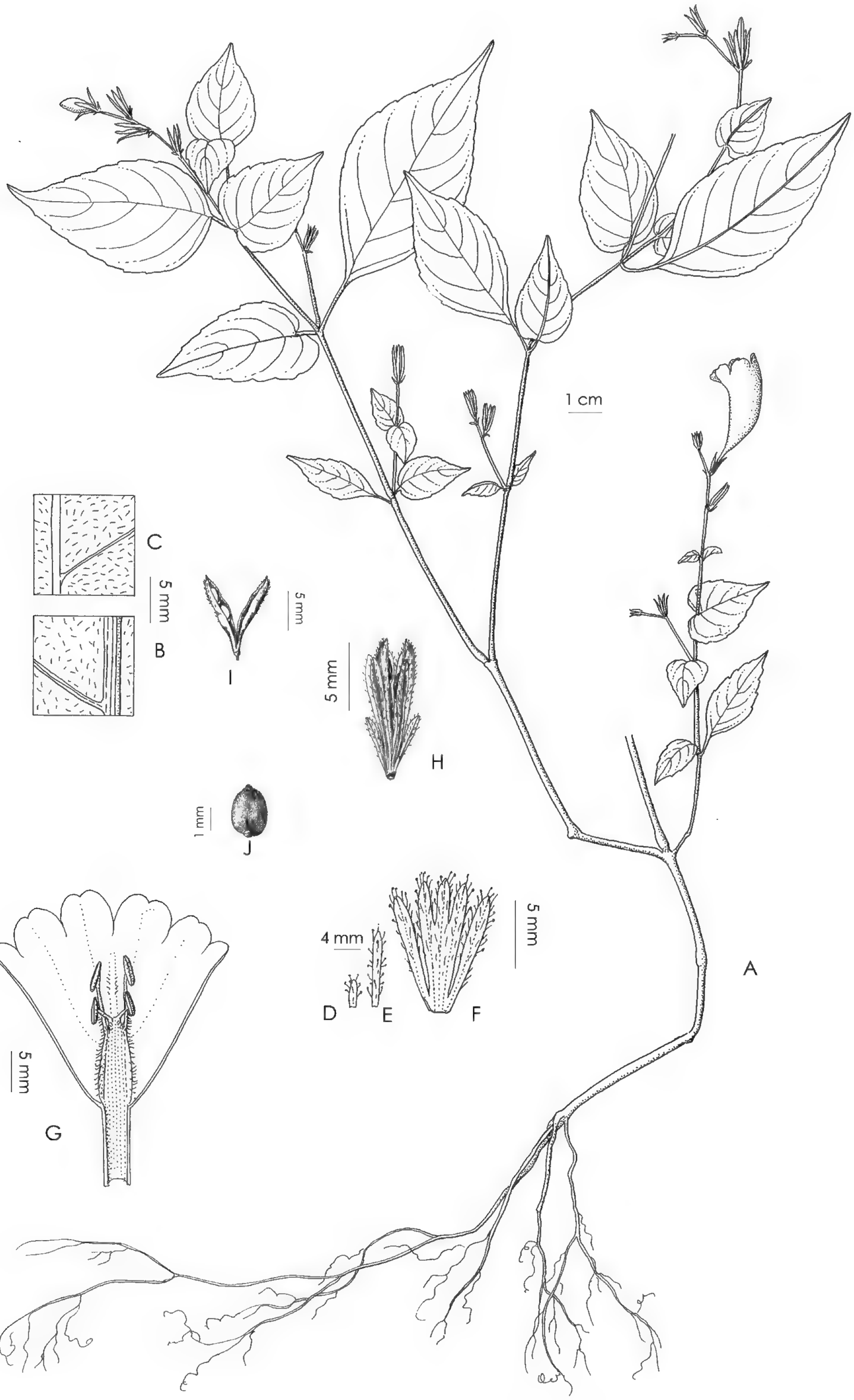

Figure 1. *Strobilanthes ovata* Y. F. Deng & J. R. I. Wood. —A. Habit. —B. Leaf blade, abaxial surface. —C. Leaf blade, adaxial surface. —D. Bract. —E. Bracteole. —F. Calyx. —G. Corolla opened to show stamens. —H. Fruiting calyx. —I. Capsule. —J. Seed. A–G drawn by Rosemary Wise from the type *Li Heng, Dao Zhilin & Yin Liwei 13101* (CAS); H–J drawn by Liu Yunxiao from the paratype *Xin Haijing 39* (IBSC).

Figure 2. SEM image of pollen of *Strobilanthes ovata* Y. F. Deng & J. R. I. Wood. Pollen sampled from *Zhou Xuan 553* (KUN).

lower lip 2-lobed almost to the base, the lobes 9–10 mm, linear-oblanceolate to subspatulate, obtuse; *corolla* light blue, 3–3.5 cm, gently curved, subventricose, outside glabrous, inside glabrous except for trichomes retaining the style, base cylindrical, ca. 10 × 2 mm, then gradually widened to ca. 1.3 cm at mouth, subequally 5-lobed, lobes ovate, ca. 4 × 4 mm; *stamens* 4, didynamous, included; filaments of the longer pair ca. 5 mm long, pilose below, the shorter pair ca. 2 mm long, glabrous; anthers oblong, ca. 2 × 1 mm; pollen ellipsoid, tricolporate, 76.8 × 40 μm, polar axis (P):equatorial diameter (E) = 1.92, ribbed, bireticulate, pseudocolpi 12, scalariform (Fig. 2); *ovary* oblong, ca. 2 mm, comose at tip; *style* ca. 2.2 cm, sparsely pilose. *Capsules* narrowly oblong-ellipsoid, ca. 12 × 2 mm, glabrous except for glandular pubescence at tip, 4-seeded; *seeds* ovate or suborbicular, ca. 3 × 2 mm, pilose with mucilaginous hairs.

Distribution and habitat. *Strobilanthes ovata* was found in southeast and northwest Yunnan, China, growing in moist forest at altitudes from 1800 to 2100 m.

IUCN Red List category. There have been no comprehensive field surveys of populations of *Strobilanthes ovata*, so this species should be classified as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001). Further field research may provide a more precise conservation assessment in the future.

Phenology. The new species was observed in flower from October to February, with fruiting from December to March.

Etymology. The species epithet was derived from the Latin "ovatus," meaning "ovate," and refers to the ovate inflorescence bracts.

Relationships. *Strobilanthes ovata* is similar to *S. decipiens* J. R. I. Wood, but differs in its glabrous leaves (vs. densely pilose), winged rhachis (vs. wingless), distant flowers (vs. imbricate), and ovate, oblong-ovate, or rounded bracts (vs. obovate) (Wood & Scotland, 2003b). It also bears some resemblance to *S. rubescens* T. Anderson in its glabrous leaves that are whitish abaxially and in the sessile upper leaves, but it can be easily distinguished by the glandular-pilose indumentum of the calyx.

Paratypes. CHINA. **Yunnan:** Baoshan Shi, Longyang Qu, Lihuipo, 16 Nov. 2000, *Li Heng with Dao Zhilin & Yin Liwei 13171* (CAS, KUN); Baoshan Shi, Longyang Qu, Lihuipo, 23 Jan. 2008, *Deng Yunfei 20458* (IBSC); Baoshan Shi, Longyang Qu, Lihuipo, 29 Sep. 2008, *Xin Haijing 39* (IBSC); Honghe Xian, *Shui Yumin 94008A* (KUN); Jinping Xian, s.d., *Dept. of Biology, Yunnan University s.n.* (KUN); Luchun Xian, way to Laobian, 2200 m, 19 Oct. 1971, *Tao Deding 1095* (KUN); Tengchong Xian, 1959, *Zhou Xuan 553* (KUN).

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A New Combination in *Stillingia* (Euphorbiaceae) for Bolivia and Argentina

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Abstract. The new combination *Stillingia tenella* (Pax & K. Hoffm.) Esser is proposed, which is based on an overlooked name originally described in *Sapium* Jacq. and replaces *Stillingia yungasensis* Belgrano & Pozner as a new synonym.

Key words: Argentina, Bolivia, Euphorbiaceae, Hippomaneae, *Sapium*, *Stillingia*.

In 2005, Belgrano and Pozner described a new species of *Stillingia* Garden ex L. (Euphorbiaceae, tribe Hippomaneae A. Juss. ex Bartl.) from Bolivia and Argentina, *S. yungasensis* Belgrano & Pozner. Their excellent publication included a wealth of data on the new taxon, including ecological and biogeographic information. Unfortunately, a senior synonym was recognized during a recent visit of the author to the herbarium at the Swedish Museum of Natural History (S), thus necessitating a new combination, which is made here.

Stillingia tenella (Pax & K. Hoffm.) Esser, comb. nov. Basionym: *Sapium tenellum* Pax & K. Hoffm. in Engler, Pflanzenr. IV.147.xvii (Heft 85), Euphorbiac. Addit. VII: 202. 1924. TYPE: Argentina. Tucumán: alrededores de Sta. Ana, Nov. 1902 (fl.), *G. A. Baer 66* (lectotype, designated by Kruijt, 1996: 90, S; isotype, G not seen).

Stillingia yungasensis Belgrano & Pozner, Syst. Bot. 30: 134, figs. 1, 2. 2005, syn. nov. TYPE: Argentina. Jujuy: Dept. Dr. Manuel Belgrano, Mina 9 de Octubre, camino a la antena, canal 7 y 4, 1500 m, 9 Feb. 1998 (fl., fr.), *O. Morrone, N. B. Deginani, A. M. Ciadella & L. M. Giussani 2336* (holotype, SI; isotypes, CTES, MO [image seen]).

From the short description of *Sapium tenellum* by Pax and Hoffmann (1924) of a single specimen with staminate flowers, it was not obvious that this is, in fact, a *Stillingia*. Vegetative evidence and a few characters of the staminate inflorescences are, however, sufficiently distinctive to place the species. *Sapium tenellum* was listed in the monograph of *Sapium* Jacq. and related genera by Kruijt (1996: 90), under his "species excludendae." Kruijt noted that this taxon, which is characterized by open, stalked petiolar glands, must be a species of *Stillingia*, and that the Bolivian collection *Steinbach 8226* (BM, E, G, K, NY, U) belongs to it. This collection is, in fact, a typical specimen of *Stillingia yungasensis*. Govaerts et al. (2000: 1423) cited *Sapium tenellum* as a new synonym of *Sapium glandulosum* (L.) Morong, but this was done without consulting the type specimens and therefore is not sufficiently justified. Zuloaga et al. (2008: 2070) cited *Sapium tenellum* as a doubtful name, most likely belonging to *Stillingia*.

For the present study, 26 collections of *Stillingia tenella* from Bolivia and 11 from Argentina were studied from the herbaria BM, CORD, CTES, E, G, K, LPB, M, MA, MO, NY, S, SI, U, and USZ. Belgrano and Pozner (2005) already cited 21 paratypes with detailed data; all but three of these were seen by the author. Several collections are stored under the name *Stillingia peruviana* D. J. Rogers; this species is, however, endemic to Peru, as was well discussed by Belgrano and Pozner.

Stillingia yungasensis was described from the provinces of Jujuy and Salta in Argentina, as well as from several Bolivian provinces. The type locality of *S. tenella* therefore slightly expands the distribution of the species. In morphological characters, the type of *S. tenella* falls well within the ranges described by Belgrano and Pozner (2005), except that the number of staminate flowers per cymule is five (instead of seven to 15 fide Belgrano & Pozner), but this is not a significant difference.

Although *Baer 66* (S) was designated as lectotype by Kruijt, it is most likely the extant holotype. It was annotated by Pax for *Das Pflanzenreich* (Pax & Hoffmann, 1924). Although the main treatments of Euphorbiaceae by Pax and Hoffmann in *Das Pflanzenreich* were usually based on specimens in B that are now lost, the supplements (Additamenta) were usually based on specimens from other herbaria, which were seen several years later and therefore published separately.

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Three New Taxa of *Chascolytrum* (Poaceae, Pooideae, Poeae) from South America

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Abstract. Two new species and one new variety of *Chascolytrum* Desv. (Poaceae) are described and illustrated. *Chascolytrum latifolium* Essi, Souza-Chies & Longhi-Wagner and *C. juergensii* var. *angustilemma* Essi, Souza-Chies & Longhi-Wagner occur in the southern Brazilian highlands, while *C. altimontanum* Essi, Souza-Chies & Longhi-Wagner occurs in the Bolivian highlands. *Chascolytrum latifolium* is related to *C. subaristatum* (Lam.) Desv., but differs mainly by the wider leaf blades and by some characteristics of the palea. *Chascolytrum altimontanum* is related to *C. paleapiliferum* (Parodi) Matthei and *C. subaristatum*, the main differences being the presence of flattened trichomes at the lemma base and the shape of the spikelets. Specimens of all these new taxa were included in a parallel molecular analysis, with the results supporting the new taxa as genetically divergent from the closest morphologically related species. In addition, *Briza juergensii* Hack. is transferred to *Chascolytrum* for the new combination *C. juergensii* (Hack.) Essi, Souza-Chies & Longhi-Wagner.

Resumo. Duas espécies novas e uma variedade de *Chascolytrum* são descritas e ilustradas nesse artigo. *Chascolytrum latifolium* Essi, Souza-Chies & Longhi-Wagner e *C. juergensii* var. *angustilemma* Essi, Souza-Chies & Longhi-Wagner ocorrem em campos de altitude do sul do Brasil, enquanto *C. altimontanum* Essi, Souza-Chies & Longhi-Wagner ocorre em regiões de altitude da Bolívia. *Chascolytrum latifolium* assemelha-se a *C. subaristatum* (Lam.) Desv., diferindo desse principalmente pelas lâminas foliares mais largas e por algumas características da pálea. *Chascolytrum altimontanum* assemelha-se a *C. paleapiliferum* (Parodi) Matthei e *C. subaristatum*, distinguindo-se destas principalmente pela presença de tricomas achatados na base do lema e pela forma das espiguetas. Exemplares de todos esses taxa foram incluídos em análise molecular paralela, sendo que os resultados corroboram os novos taxa como geneticamente divergentes das espécies mais semelhantes morfologicamente. Além disso, *Briza juergensii* Hack. é transferida para *Chascolytrum* para a nova combinação *C. juergensii* (Hack.) Essi, Souza-Chies & Longhi-Wagner.

Key words: *Chascolytrum*, IUCN Red List, Poaceae, Poeae, Pooideae, South America.

According to Matthei (1975), *Chascolytrum* Desv. (Poaceae, Pooideae, Poeae) included six South American species related to the Eurasian genus *Briza* L. Before Matthei (1975), *Chascolytrum* was considered at the rank of genus (Desvaux, 1810) or section (e.g., Bentham & Hooker, 1883), or as a subgenus of *Briza* (e.g., Parodi, 1920), so that its taxonomic circumscription was controversial. A phylogenetic molecular analysis performed using three DNA regions (ITS, GBSSI, and *trnL-trnL-trnF*) has resulted in a broader circumscription for the genus *Chascolytrum* (Essi et al., 2008), with 22 species, including the three new taxa described here.

1. **Chascolytrum altimontanum** Essi, Souza-Chies & Longhi-Wagner, sp. nov. TYPE: Bolivia. Chuquisaca: Yamparaez, on the ascent, ca. 3 km E toward La Cienaga, 16 Mar. 1996, *J. R. I. Wood 10841* (holotype, LPB; isotype, K). Figures 1, 4B.

Haec species lemmatibus gibbis conspicue alatis et paleis coriaceis elliptico-orbicularibus usque orbicularibus *Chascolytro subaristato* (Lam.) Desv. et *C. paleapilifero* (Parodi) Matthei similis, etiam *C. subaristato* spiculis cylindricis et *C. paleapilifero* trichomatibus capitatis in dorso palearum similis, sed ab ambabus speciebus trichomatibus spathulatis copiosis in parte basali lemmatum, etiam a *C. paleapilifero* spiculis cylindricis differt.

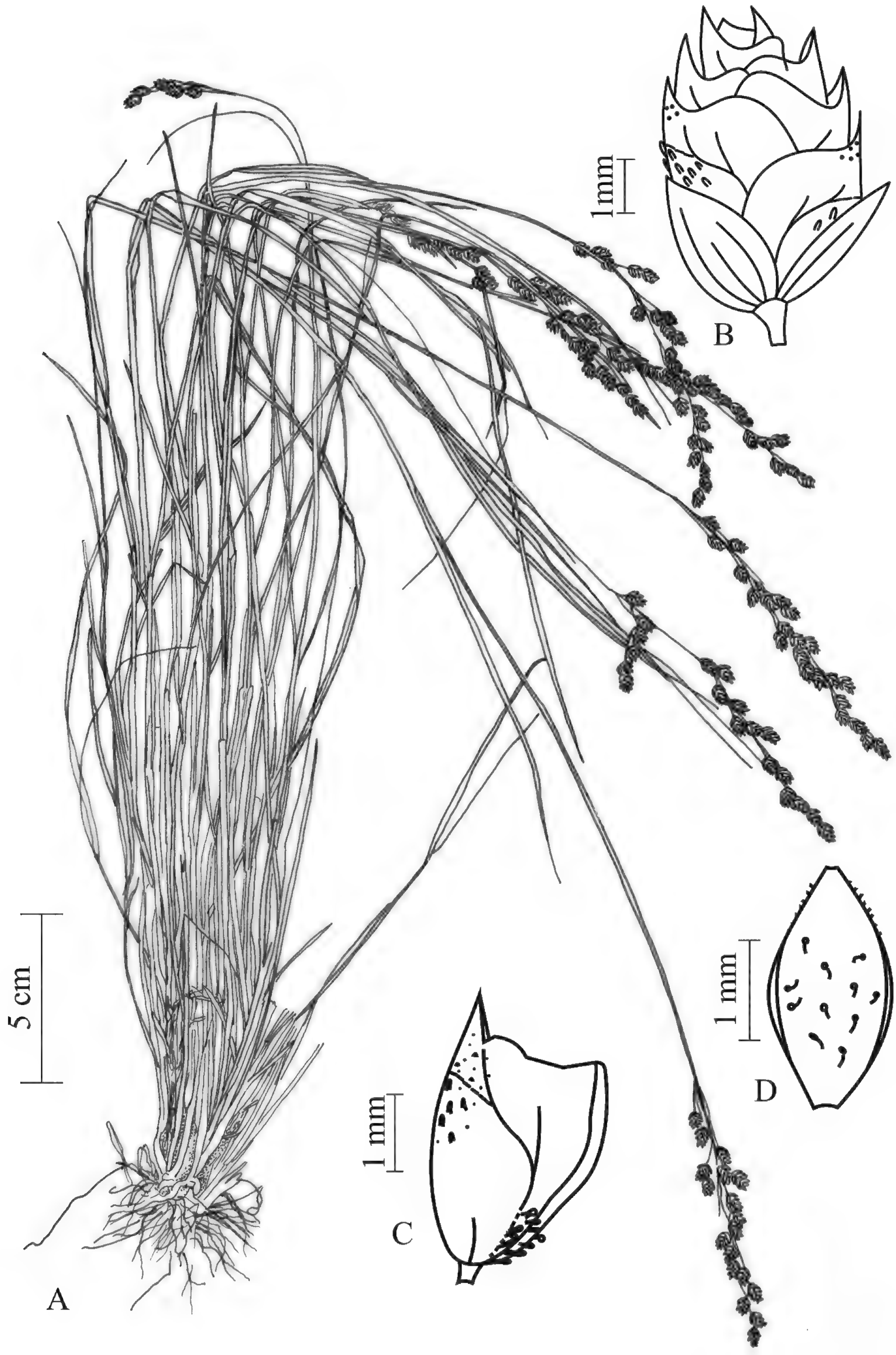

Figure 1. *Chascolytrum altimontanum* Essi, Souza-Chies & Longhi-Wagner. —A. Habit. —B. Spikelet. —C. Lemma, lateral view. —D. Palea, dorsal view. Drawn from the type *Wood 10841* (LPB). Parts B–D drawn by L. Essi.

Plants 45–77 cm high; basal internodes of the culms not thickened; basal innovations extravaginal. Leaf sheaths glabrous, smooth, margins non-overlapping; leaf blades linear, 7–45 cm × 0.8–2.2 mm, flat or convolute, glabrous; ligules 1.8–2.5 mm, acute. Panicle contracted, erect, 3–7 cm; pedicels smooth. Spikelets 5.5–6 × ca. 4 mm, 5- to 8-flowered, cylindrical, oblong; florets imbricate, obscuring the

rachilla; glumes herbaceous, convex, glabrous, smooth, acute or obtuse, subequal; lower glume 2.3–3 × 0.9–1.5 mm, 5-nerved; upper glume 2.3–3 × 1–1.5 mm, 5-nerved; lemmas chartaceous to coriaceous, dorsiventrally compressed, with a gibbous pale back, back strongly distinct from the broad margins, cordate to slightly attenuate at the base, 7-nerved, midvein non-salient on the back, glabrous or with sparse flattened trichomes on the back, truncate or acute at the apex, muticous or mucronate, margins with dense flattened trichomes at the base, inrolled or not at the base, without oil glands; lower lemma 2.5–3.8 × 1.2–2 mm; paleae elliptic-orbicular to orbicular, coriaceous, with capitate trichomes between the keels, occasionally deciduous at maturity, keels ciliolate at the upper half; lower palea 1.5–1.8 × 1–1.2 mm; lodicules flabelliform; stamens 1 or 2. Caryopsis suborbicular, planoconvex; hilum elliptic to linear-elliptic.

Distribution and habitat. *Chascolytrum altimontanum* occurs in the Bolivian highlands. This species is found on dry hill slopes, between 2200 and 3600 m.

IUCN Red List category. The total area of occurrence of *Chascolytrum altimontanum* is ca. 60,000 m^2, comprising the specimens found in ca. 11 locations. However, there is no precise information available for the size or fragmentation of the populations. Collection labels commonly indicate this grass as rare, but it is also necessary to evaluate the quality of the habitats. A factor that hinders the evaluation of the species status is the fact that *C. altimontanum* at first sight is similar to *C. subaristatum* (Lam.) Desv., which is a common grass broadly distributed across South America and extending to Guatemala and Mexico. Thus, the size of the populations may be overestimated. Because population size and extent have not been established or monitored for this species in any part of its range, it must be classified as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Notes. Many herbarium specimens of *Chascolytrum altimontanum* have been identified either as *C. subaristatum* or *C. paleapiliferum* (Parodi) Matthei. Indeed, *C. altimontanum* is morphologically related to both species, with the three species sharing similar palea and lemma shapes, and coriaceous palea. Because the new species presents capitate hairs between the palea keels, some individuals were misidentified as *C. paleapiliferum*. However, the new species differs by the shape of the spikelets and by the presence of dense, flattened trichomes at the lemma base. The geographic distribution is also distinctive: *C. altimontanum* is restricted to the Bolivian highlands while *C. paleapiliferum* is mainly restricted to the Argentinian highlands. The presence of dense flattened trichomes at the lemma base is also a remarkable difference between *C. altimontanum* and *C. subaristatum*. The latter species is widely distributed in South America, extending to Mexico, in a broader range of habitats. A collection of this new species (*Wood 10768*, LPB) was included in molecular analyses, which supports *C. altimontanum* as genetically distant from both *C. paleapiliferum* and *C. subaristatum* (Essi et al., 2008).

Paratypes. BOLIVIA. **Chuquisaca:** on E side of Cerro Chataquila near Punilla (Sucre-Ravelo), 9 Apr. 1995, *J. R. I. Wood 9665* (LPB); Tomina, Lampacillas, ca. 30 km S of Padilla toward Monteagudo, 31 Dec. 1994, *J. R. I. Wood 9068* (K, LPB); Oropeza, ca. 2 km beyond Sucre airport toward Ravelo, 25 Feb. 1996, *J. R. I. Wood 10768* (K, LPB); Vamporz, Sucre, SE of the town, 17 Apr. 1994, *J. R. I. Wood 8314* (K). **Cochabamba:** Mizque a 10 km S of Totora toward Aiquile, 19 Dec. 1995, *J. R. I. Wood 9461* (K); Tapacarí, entre Parotani y Challa, 21 Feb. 1979, *Ceballos, Charpin, Casas & Bermejo BO-445* (G); Tiraque, on pass just W of Sacabambilla on old Cochabamba–Santa Cruz rd., 2 Feb. 1996, *J. R. I. Wood 10486* (LPB); Prov. Chapare, Parque Tunari, bosque de *Polylepsis*, 23 Feb. 1991, *J. Hensen 998* (LPB); 51 km W of Cochabamba, 3100 m, 25 Mar. 1981, *S. Renvoize & T. Cope 4082* (K). **Santa Cruz:** Caballero, at summit of rd. on Loma Grande, ca. 6–8 km W of Comarapa on rd. to Siberia, 13 Mar. 2002, *J. R. I. Wood 17802* (K); Vallegrande, ca. 16 km from Vallegrande on rd. to Masucuri, 11 Feb. 1996, *J. R. I. Wood 10601* (LPB); Voladerogebirge, 29 Jan. 1928, *C. Troll 1101* (B, M).

2. Chascolytrum latifolium Essi, Souza-Chies & Longhi-Wagner, sp. nov. TYPE: Brazil. Santa Catarina: Urubici, Faz. Arno Philippi, 7 Dec. 2006, *H. M. Longhi-Wagner, A. Zanin & L. Souza 10228* (holotype, ICN; isotypes, FLOR, K, MO). Figures 2, 4A.

Haec species spiculis cylindricis et lemmatibus aristulatis late alatis *C. subaristato* (Lam.) Desv. similis, sed ab eo lamina foliari generaliter latiore et paleis elliptico-lanceolatis membranaceis trichomatibus longis secus costas ornatis (nec elliptico-orbicularibus usque orbicularibus, coriaceis) praecipue differt.

Plants 27–87 cm high; basal internodes of the culms not thickened; basal innovations extravaginal. Leaf sheaths glabrous, margins non-overlapping; leaf blades linear-lanceolate, 7.5–40 cm × (4–)7–12 mm, flat, glabrous; ligules 1.5–4 mm, truncate. Panicle open, pendulous, 9–15 cm; pedicels scabrous. Spikelets 5–6 × (1.5–)4–5.1 mm, 4- to 8-flowered, subcylindrical, oblong; florets imbricate, obscuring the rachilla; glumes herbaceous, convex to naviculate, glabrous, smooth, subequal; lower glume 3.2–3.9 × 0.6–1.5 mm, 3-nerved; upper glume 3.2–4 × 1.1–1.5 mm, 3- to 5-nerved; lemmas herbaceous, slightly laterally com-

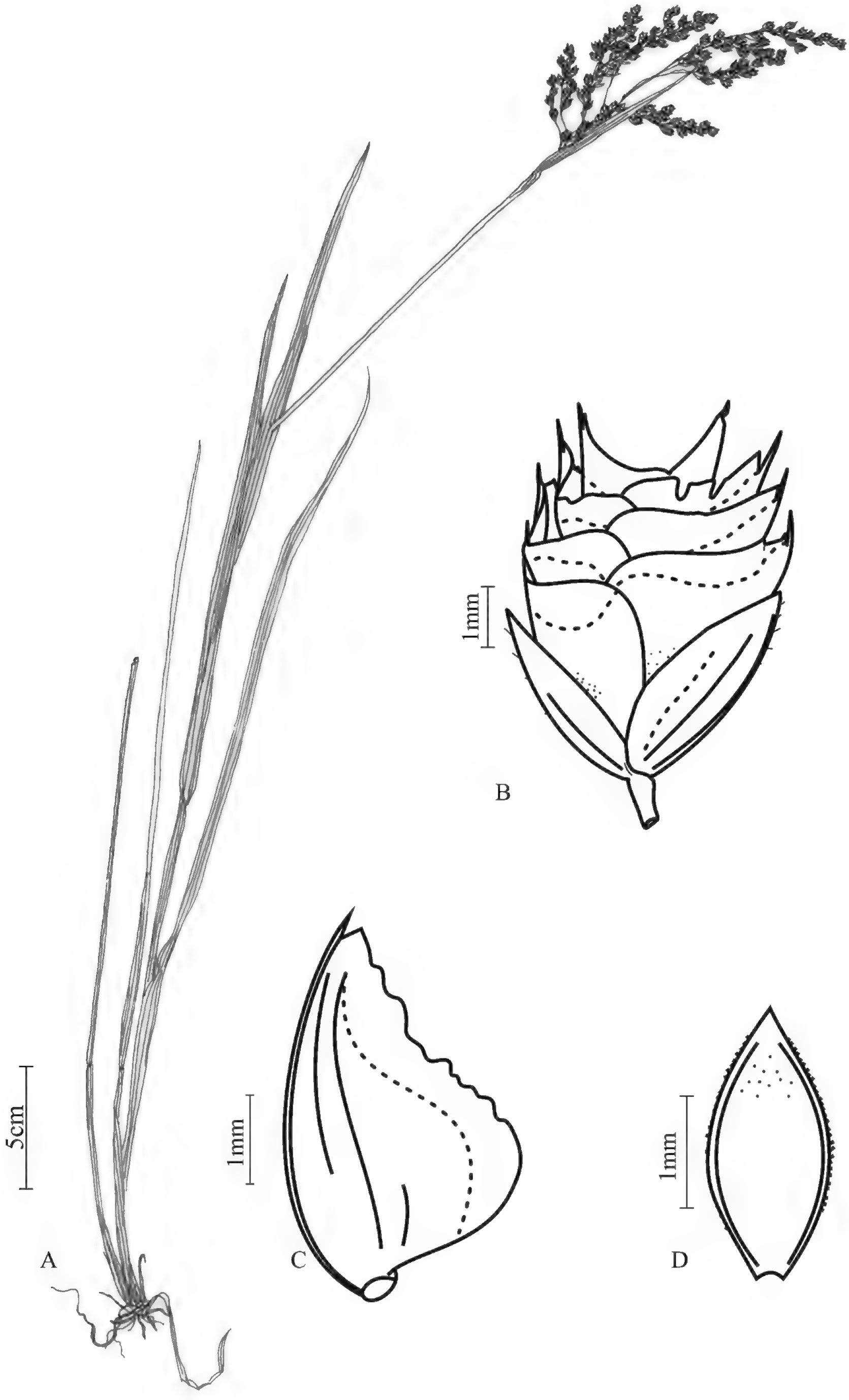

Figure 2. *Chascolytrum latifolium* Essi, Souza-Chies & Longhi-Wagner. —A. Habit. —B. Spikelet. —C. Lemma, lateral view. —D. Palea, dorsal view. Drawn from the type *Longhi-Wagner, Zanin & Souza 10228* (ICN). Parts B–D drawn by L. Essi.

pressed, without a gibbous back, with broad margins not distinct from the back, slightly attenuate at the base, 7-nerved, midvein non-salient on the back, glabrous, acute, truncate, or bidentate at the apex, mucronate, margins glabrous, smooth or scaberulose at the apex, not inrolled at the base, without oil glands; lower lemma 3.9–4 × 1.4–2.5 mm; paleae elliptic-lanceolate, membranous, glabrous and smooth between

the keels, keels ciliate; lower palea 2.8–3.2 × 1.1–1.7 mm; lodicules linear; stamen 1. Caryopsis suborbicular, planoconvex; hilum elliptic.

Distribution and habitat. *Chascolytrum latifolium* occurs in southern Brazil. This species is found in wet soils with species of *Sphagnum* L. in high-altitude grasslands, mainly in southeastern Santa Catarina, at altitudes of 1400–1580 m, and also in northeastern Rio Grande do Sul, at ca. 800 m.

IUCN Red List category. *Chascolytrum latifolium* is considered Near Threatened (NT) according to IUCN Red List criteria (IUCN, 2001), but approaches the criteria B1ab(iii) and B2ab(iii) for the category of Vulnerable (VU). The extent of occurrence of this species is ca. 27,000 km^2, but it occurs only at high altitudes in five areas, and the area of occupancy is estimated to be much smaller due to population fragmentation. In the area called Campo dos Padres, in Santa Catarina State, this species is more common and the populations have more individuals. However, collections in other locations are rare and the populations are smaller. Of concern is the reduction of the preserved habitats where this species occurs, but one positive action is already in progress: the area where this species is more abundant is being proposed as a national preservation area named Parque Nacional do Campo dos Padres, which will help in its preservation.

Notes. This new species seems to be a morphological link between the genera *Chascolytrum* and *Poidium* Nees, as accepted by Matthei (1975). *Chascolytrum latifolium* presents wide lemmas, as in typical *Chascolytrum*, but the paleae are elliptic-lanceolate and membranous, as seen in *Poidium*. The delicate consistency of the lemma is also remarkable. The wide, flat, shiny green leaf blades and the pendulous, dense inflorescences of this new species are easy to recognize in the field. A collection of this new species (*Essi, Guglieri & Hefler 201*, ICN) was included in a phylogenetic molecular analysis (Essi et al., 2008) and was found to be closer to *C. juergensii* (Hack.) Essi, Souza-Chies & Longhi-Wagner (= *Poidium juergensii* (Hack.) Matthei, sensu Matthei, 1975) than to *C. subaristatum* (sensu Matthei, 1975).

Paratypes. BRAZIL. **Rio Grande do Sul:** São José dos Ausentes, Monte Negro, 2 Dec. 2003, *L. Essi, A. Guglieri & S. Hefler 159* (ICN). **Santa Catarina:** Bom Retiro, Campo dos Padres, 16 Dec. 1948, *R. Reitz 2389* (HBR), 18 Dec. 1948, *R. Reitz 2553* (HBR, S), 23 Jan. 1957, *L. B. Smith & R. Reitz 10311* (HBR, RB); Bom Retiro, Campo dos Padres, betw. Faz. Campo dos Padres & Faz. Santo Antônio, 21 Nov. 1956, *B. Smith & R. M. Klein 7804* (HBR, NY); São Joaquim [Urubici] Morro da Igreja, Faz. Morrinhos, Campestre do Malacara, 22 Jan. 1960, *J. Mattos 7448* (BLA); São Joaquim, Campestre do Malacara, Faz. de Morrinhos, 22 Jan. 1960, *J. Mattos 8462* (HAS); Parque Nac. São Joaquim, 2001, *H. M. Longhi-Wagner & Garcia 7377* (ICN); Urubici, Faz. Arno Philippi, 7 Dec. 2006, *H. M. Longhi-Wagner, A. Zanin & L. Souza 10229, 10230* (ICN); Urubici, Morro da Igreja, em frente à Cavalgada, próx. do quartel, 4 Dec. 2003, *L. Essi, A. Guglieri & S. Hefler 201* (ICN).

The following key distinguishes the newly described species of *Chascolytrum* from morphologically related species:

KEY TO DESCRIBED SPECIES AND MORPHOLOGICALLY RELATED SPECIES OF *CHASCOLYTRUM* IN SOUTH AMERICA

1a. Paleae membranous, ciliate on the keels; lemmas herbaceous; leaf blades 7.5–40 cm × (4–)7–12 mm . . . . . *C. latifolium*
1b. Paleae coriaceous, glabrous or ciliolate on the keels; lemmas chartaceous to coriaceous; leaf blades 6–50 cm × 0.8–6.5 mm.
  2a. Paleae glabrous between the keels, rarely pilose, trichomes noncapitate; lemma margins glabrous . . . . . *C. subaristatum*
  2b. Paleae with capitate trichomes between the keels, occasionally deciduous at maturity; lemmas with or without flattened trichomes on margins at the base.
    3a. Margins of the lemma with dense flattened trichomes at the base; lower lemma 2.5–3.8 mm long; spikelets cylindrical . . . . . *C. altimontanum*
    3b. Margins of the lemma glabrous (rarely 2 to 4 capitate trichomes around the callus); lower lemma 4.5–5 mm long; spikelets subcylindrical to laterally compressed . . . . . *C. paleapiliferum*

Chascolytrum juergensii belongs to a group of species with a very controversial circumscription at the genus level, referred to by Matthei (1975) as the *Briza* complex. Based on morphology only, there was no consensus about the best circumscription for the genera belonging to this group (e.g., *Poidium*, *Briza*, and *Chascolytrum*), and thus a molecular phylogenetic analysis was performed (Essi et al., 2008). Considering the results of this analysis, a new circumscription was proposed for the complex, maintaining the Eurasian species in the genus *Briza*, but including all the South American species studied into a single genus, *Chascolytrum*, so that this genus is considered now in a broader circumscription (*Chascolytrum* s.l.). New combinations are therefore required for *Chascolytrum* s.l. (Essi et al., submitted), including the new combination made here.

3. Chascolytrum juergensii (Hack.) Essi, Souza-Chies & Longhi-Wagner, comb. nov. Basionym: *Briza juergensii* Hack., Verh. K.K. Zool.-Bot. Ges. Wien 65: 76–77. 1915. *Poidium juergensii*

(Hack.) Matthei, Willdenowia 8: 114. 1975. TYPE: Brazil. Rio Grande do Sul: Pinheiral, Mpio. Rio Pardo, 70 m, 1909, *C. Jürgens* (holotype, W).

3a. Chascolytrum juergensii var. **juergensii**.

3b. Chascolytrum juergensii var. **angustilemma** Essi, Souza-Chies & Longhi-Wagner, var. nov. TYPE: Brazil. Rio Grande do Sul: Cambará do Sul, perto do Fortaleza, 29°04′54.6″S, 050°00′14.4″W, 1 Dec. 2003, *L. Essi, A. Guglieri & S. Hefler 122* (holotype, ICN; isotypes, K, MO). Figure 3.

A varietate typica lemmatibus angustioribus non gibbosis lateraliter distincte alatis differt.

Plants 28–70 cm high; basal internodes of the culms not thickened; basal innovations extravaginal. Leaf sheaths glabrous, margins non-overlapping; leaf blades linear-lanceolate, 7–23 cm × 2–7 mm, flat, glabrous; ligules 1–2.5 mm, obtuse to truncate. Panicle open, erect or pendulous, 4.5–15 cm; pedicels smooth. Spikelets 5.2–6 × 2–3.2 mm, 4- to 6-flowered, laterally compressed, elliptic-lanceolate; florets imbricate, obscuring the rachilla, or loosely imbricate, rachilla apparent; glumes herbaceous, naviculate, glabrous, smooth, subequal; lower glume 2.8–3 × 0.5–0.9 mm, 3-nerved; upper glume 3–3.3 × 0.7–1 mm, 3- to 5-nerved; lemmas chartaceous or coriaceous, laterally compressed, pale, without a gibbous back, margins narrow, not distinct from the back, rounded to slightly attenuate at the base, 5-nerved, midvein non-salient on the back, lemmas pilose, acute at the apex, muticous, margins glabrous or sparsely pilose, inrolled or not at the base, without oil glands; lower lemma 3.1–3.9 × 1–1.2 mm; paleae lanceolate, membranous, pilose between the keels, keels ciliate; lower paleae 2–2.5 × 0.7–1 mm; lodicules linear-lanceolate; stamens 1 to 3. Caryopsis elliptic, concavo-convex; hilum elliptic.

Distribution and habitat. *Chascolytrum juergensii* var. *angustilemma* occurs in Brazil, mainly in Rio Grande do Sul and Santa Catarina, the southernmost states in Brazil. There are only two records of variety *angustilemma* for other states (one record from Minas Gerais and another from São Paulo), and its distribution is concentrated in Rio Grande do Sul, while the typical variety is distributed more broadly in other southern states of Brazil and in Colombia. Variety *angustilemma* is found in high-altitude wet grasslands surrounded by *Araucaria angustifolia* (Bertol.) Kuntze (Araucariaceae) forests; variety *juergensii* is also found in wet soils, but in open grasslands.

IUCN Red List category. *Chascolytrum juergensii* var. *angustilemma* is assessed here as Near Threatened (NT) according to IUCN Red List criteria (2001), but approaches criterion B2ab(iii) for the category Vulnerable (VU). The extent of the taxon's occurrence is ca. 550,000 km², but the population is severely fragmented. There are about 11 locations where this variety was found, with most populations concentrated in Rio Grande do Sul State. This Red List assessment is principally due to the reduction of habitat because the areas containing *Araucaria angustifolia* (an endangered tree species, det. Farjon [IUCN, 2009]), where the new variety usually occurs, are being progressively fragmented. It is also important to point out that the grasslands in northeastern Rio Grande do Sul State are being reduced due to forestation with species of *Pinus* L., a new commercial activity of high ecological impact in this ecosystem.

Notes. Matthei (1975) mentioned that the Colombian specimens of *Chascolytrum juergensii* present slightly narrower lemmas than the Brazilian material. However, *C. juergensii* var. *angustilemma* lemmas are even narrower than the Colombian material. Longhi-Wagner (1987: 37) previously emphasized this difference, provisionally naming this new taxon as "*Briza* aff. *juergensii*." The distribution of the new variety, as currently known, is restricted and generally associated with populations of *Araucaria angustifolia*. Plants are shorter than those of *C. juergensii* var. *juergensii*, ranging to 28–70 cm in height, with more delicate culms, while the typical variety usually presents 65–150 cm in height.

A collection of this new variety (*Longhi-Wagner 8759*, ICN) was included in a molecular phylogenetic analysis (Essi et al., 2008) and was found to be distinct from the typical variety.

Paratypes. BRAZIL. **Minas Gerais:** Camanducaia, Monte Verde, 22 Jan. 2002, *H. M. Longhi-Wagner 8009* (ICN). **Rio Grande do Sul:** Bom Jesus, sede, 300 m após entroncamento propre Vacaria, 29 Nov. 1975, *Sampaio, H. M. Longhi & H. Winge 102* (ICN); Bom Jesus, Aparados da Serra, Dec. 1954, *Barreto s.n.* (BLA); Cambará do Sul, Itaimbezinho, 4 Jan. 1974, *M. C. M. Hickenbick 92* (ICN), 28 Nov. 1975, *M. T. S. Sampaio, H. M. Longhi & H. Winge 58, 59, 61, 62* (ICN), 7 Jan. 1977, *M. T. S. Sampaio, H. Winge & L. Arzivenco 406, 411* (ICN), 15 Jan. 1979, *C. T. Lemos & M. T. S. Sampaio 33, 36* (ICN), 1 Dec. 1981, *H. M. Longhi-Wagner et al. 957, 959, 960* (ICN); Cambará do Sul, Itaimbezinho, Bela Vista, 1 Dec. 1981, *H. M. Longhi-Wagner et al. 949* (ICN), *A. M. Sacchet 28* (ICN); Cambará do Sul, Fortaleza dos Aparados, 28 Nov. 1975, *H. M. Longhi, M. T. S. Sampaio & H. Winge 315, 325, 328* (ICN); Cambará do Sul, Parque Nac. da Serra Geral, 29°03′43.9″S, 049°57′23.7″W, 1 Dec. 2003, *L. Essi, A. Guglieri & S. Hefler 135, 136, 139* (ICN); Cambará do Sul, a caminho do Parque, 17 Nov. 2004, *L. Essi 295* (ICN); São Francisco de Paula, Itaimbezinho, 20 Feb. 1953, *B. Rambo 54022* (B), *B.*

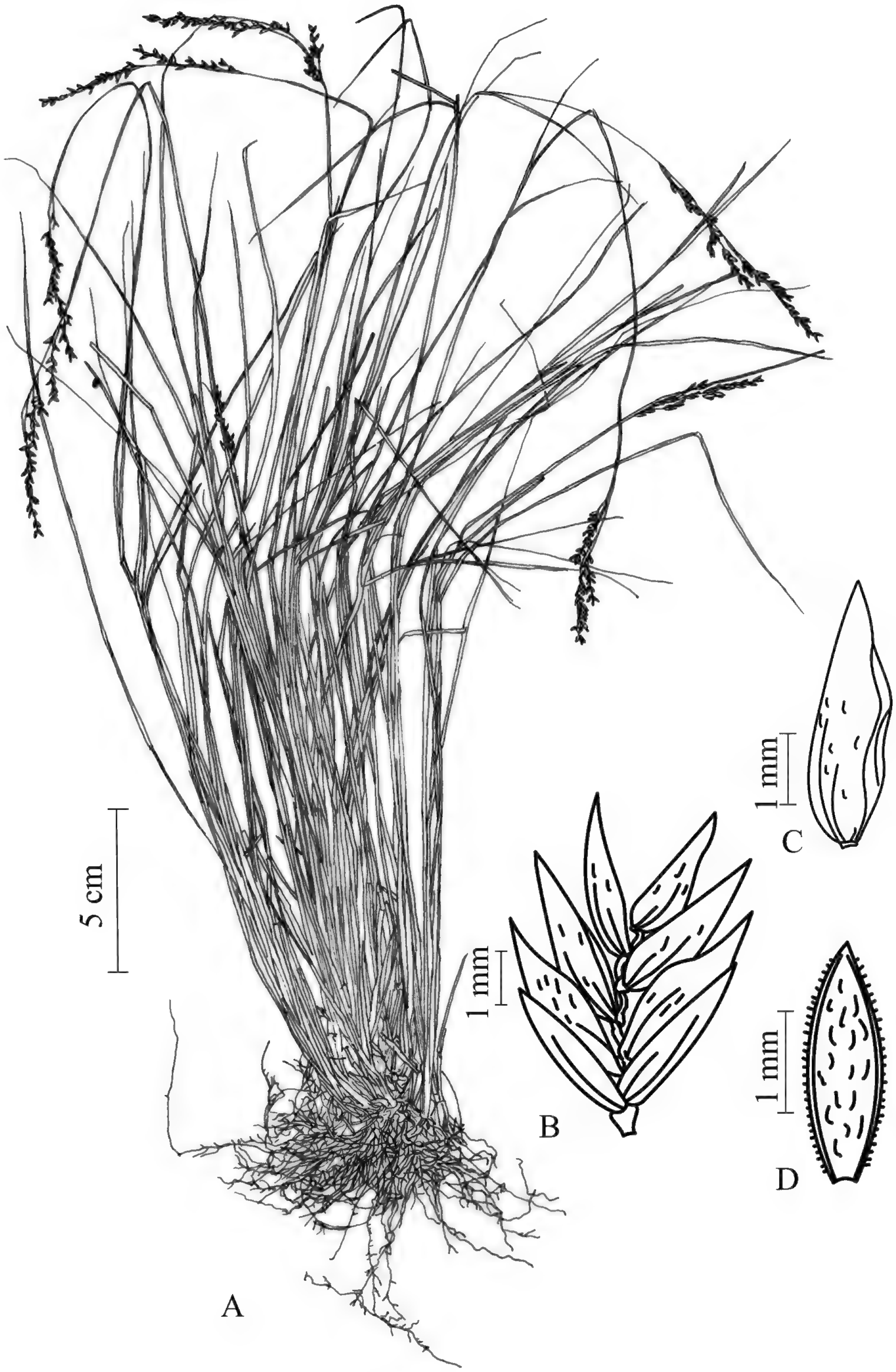

Figure 3. *Chascolytrum juergensii* var. *angustilemma* Essi, Souza-Chies & Longhi-Wagner. —A. Habit. —B. Spikelet. —C. Lemma, lateral view. —D. Palea, dorsal view. Drawn from the type *Essi, Guglieri & Hefler 122* (ICN). Parts B–D drawn by L. Essi.

Rambo s.n. (PACA); São José dos Ausentes, Monte Negro, 28°37′00.6″S, 049°47′42.1″W, 2 Dec. 2003, *L. Essi, A. Guglieri & S. Hefler 152* (ICN). **Santa Catarina:** Água Doce, 6 Nov. 1971, *L. B. Smith, R. M. Klein & G. Hatschbach 15700* (HBR); Bom Jardim, Curral Falso, 19 Nov. 1959, *R. Reitz & R. M. Klein 8405* (HBR); Bom Jardim, Serra do Oratório, 9 Dec. 1958, *R. Reitz & R. M. Klein 7642* (HB, HBR, L); Caçador, 2 Dec. 1964, *L. B. Smith & R. M. Klein 13367*

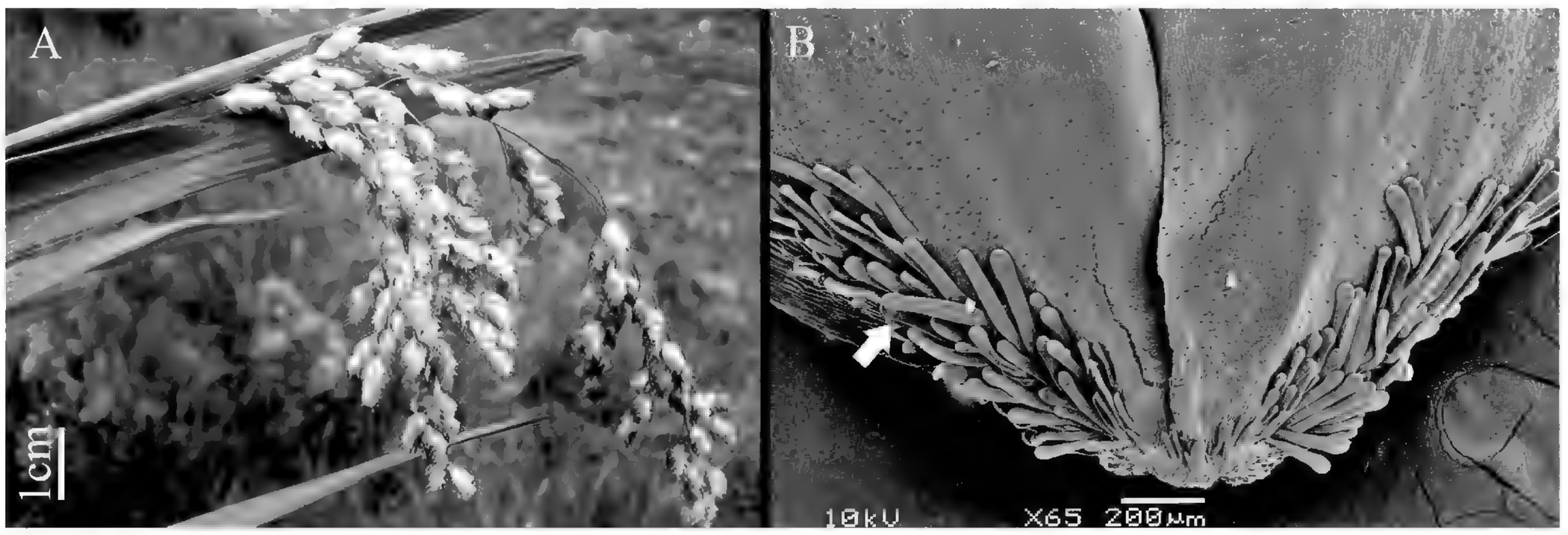

Figure 4. —A. Panicle of *Chascolytrum latifolium*. —B. SEM image of the lemma base in dorsal view for *C. altimontanum*. The arrow indicates the flattened trichomes.

(HBR, MO, S); Campo dos Padres, 22 Jan. 1957, *B. Rambo s.n.* (B 1001176910); Lauro Müller, a 25 km pasando la Serra do Rio do Rastro, 7 Dec. 1992, *Z. Rúgolo, H. M. Longhi-Wagner, S. Boechat & M. Molina 1478* (MO); Porto União, 27 Oct. 1962, *R. Reitz & R. M. Klein 13670* (HBR); Porto União, S. Miguel, 29 Dec. 1936, *B. Rambo s.n.* (HBR 2643); São Joaquim, bosque com *Araucaria* perto do mirante, próx. à desc. da Serra do Rio do Rastro, 30 Jan. 2003, *H. M. Longhi-Wagner 8759* (ICN). **São Paulo:** Campos do Jordão, 9 Dec. 1995, *H. M. Longhi-Wagner & K. Witten 2793* (ICN).

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The *Astragalus minimus* (Leguminosae, Galegeae) Complex and One New Species for Chile and Argentina

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Abstract. *Astragalus minimus* Vogel (Leguminosae) is endemic to the Andean region of South America, in Peru, Bolivia, Chile, and northwestern Argentina. This taxon belongs to a pulvinate species complex in the genus *Astragalus* L. (Leguminosae, Galegeae) from high mountain puna vegetation, between 4000 and 4500 m in the Neotropics. The *A. minimus* complex is newly delimited, in particular with information for the fruit, which was not described in Vogel's 1843 protologue. This new information allows the identification of *A. tacorensis* Gómez-Sosa as a species new to science; both taxa are morphologically described and illustrated.

Resumen. *Astragalus minimus* Vogel (Leguminosae) es endémica de la región andina de América del Sur, en Perú, Bolivia, Chile y noroeste de Argentina. Este taxon pertenece a un grupo o complejo de especies pulvinadas del género *Astragalus* L. (Leguminosae, Galegeae) de alta montaña de los Andes en vegetación de puna, entre 4000 y 4500 m en el Neotropico. El complejo de *A. minimus* es nuevamente delimitado e incluye información, particularmente de fruto del ejemplar tipo, no descrito previamente en el protologo de Vogel (1843). Esta nueva información permite la identificación de *A. tacorensis* Gómez-Sosa como una nueva especie para la ciencia; ambos taxa son morfológicamente descriptos e ilustrados.

Key words: Argentina, *Astragalus*, Bolivia, Chile, Galegeae, IUCN Red List, Leguminosae, Peru.

One group of South American *Astragalus* L. (Leguminosae, Galegeae) has in common principally vegetative aspects; these plants are diminutive, matted or tufted, acaulescent herbs with a branched caudex thatched with marcescent stipules. For this reason, flower and fruit characters are necessary for taxonomic identification, and consequently many herbarium collections are misnamed. The two taxa presented here belong in this group with pulvinate vegetative forms.

The type for *Astragalus minimus* Vogel was collected in Peru by Meyen in 1831 and the species was later published by Vogel (1843), but the protologue lacked description of the fruits. Macbride (1943: 398), in the *Flora of Peru*, presented flower and fruit characteristics with respect to the specimen *Werdermann 1136* cited by I. M. Johnston (B, G), who did not examine Meyen's type collection. Johnston (1947) did not include a description for *A. minimus*, but did comment that "our present species frequently has the fruit elevated on a short but definite 1–2-flowered peduncle 2–6 mm long," and further added in the key: "flowers solitary or geminate, fruit with a more or less incomplete membranous false septum; valves rather firm and tough" (Johnston, 1947: 344). Those characteristics correspond to the Werdermann collection, but do not correlate with the Meyen type.

Study of the type specimen of *Astragalus minimus* at P allows the description of the hitherto unknown and evanescent fruit and the identification of a new species:

1. Astragalus tacorensis Gómez-Sosa, sp. nov. TYPE: Chile. Tacna: Cordillera Volcán Tacora, 4300 m, Apr. 1926, *E. Werdermann 1136* (holotype, G; isotypes, B, LIL, SI, TUC, US). Figures 1, 3A, B.

Haec species *Astragalo minimo* Vogel similis, sed ab eo foliis longioribus, pedunculo 0.5 cm longo, floribus pedicellatis, legumine oblique ovoideo 6–7 mm longo subbiloculari septo membranaceo incompleto diviso atque seminibus numerosioribus distinguitur.

Diminutive, matted or tufted, pulvinate herbs appearing acaulescent, with branched caudex thatched with membranous, amplexicaul, glabrescent stipules. Foliage white pubescent to glabrescent; leaves 1.5–2 cm; leaflets 9 to 15, distantly spaced, oblong, apex retuse, folded, adaxially glabrous or finely and scattered pubescent only at margin and abaxially. Peduncles ca. 0.5 cm, (1)2-flowered, immersed in foliage or scarcely exserted; pedicels ascending, 1–2 mm. Calyx 2.5–4 mm, pubescent; banner 5.5–6.5 × 2.5–3.5 mm; wings ca. 3.5 mm; ovary white pubescent; ovules 8(to 10). Pods white, finely strigulose, obliquely ovoid, 6–7 × ca. 2.5 mm,

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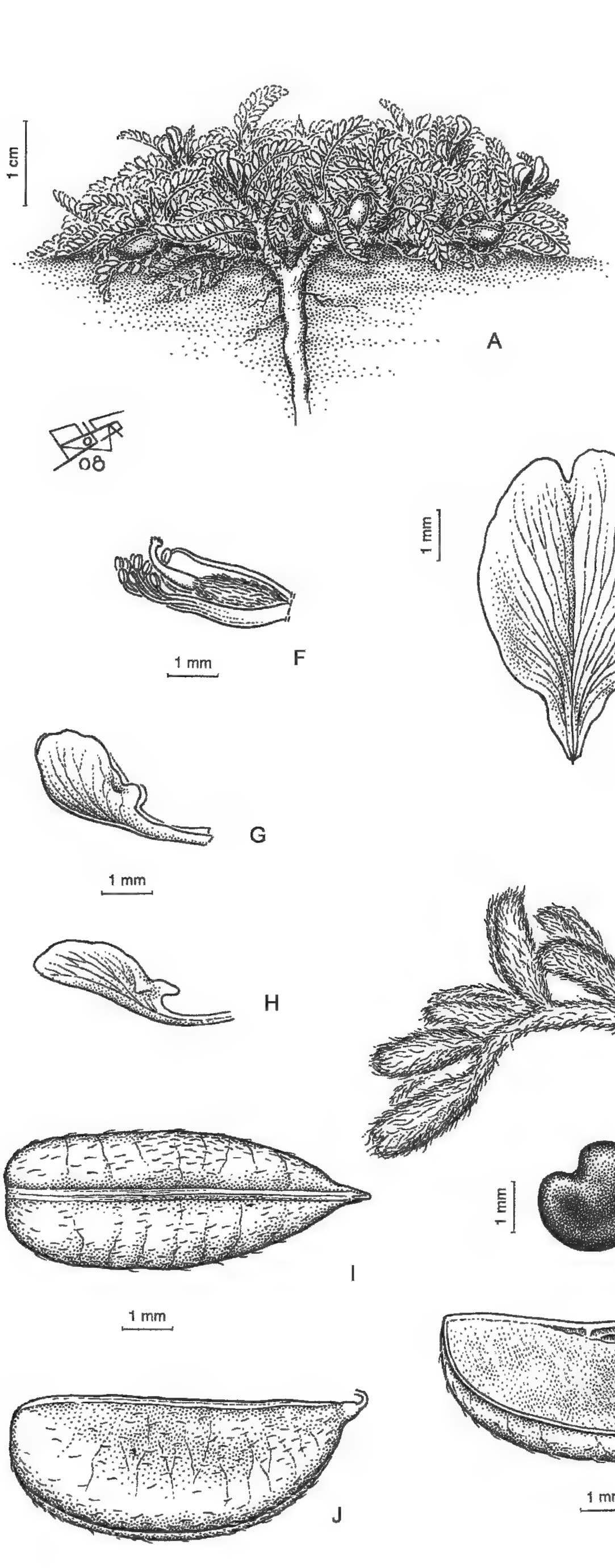

Figure 1. *Astragalus tacorensis* Gómez-Sosa. —A. Plant habit. —B. Apex of branch with flowers. —C. Leaflet, abaxial view (left) and adaxial view (right). —D. Calyx, with internal view of tooth at right. —E. Banner. —F. Androecium and gynoecium. —G. Keel. —H. Wing. —I. Fruit, dorsal view. —J. Fruit, lateral view. —K. Fruit, longitudinal section with the partial septa and seeds visible. —L. Seed. Based on the holotype *Werdermann 1136* (G).

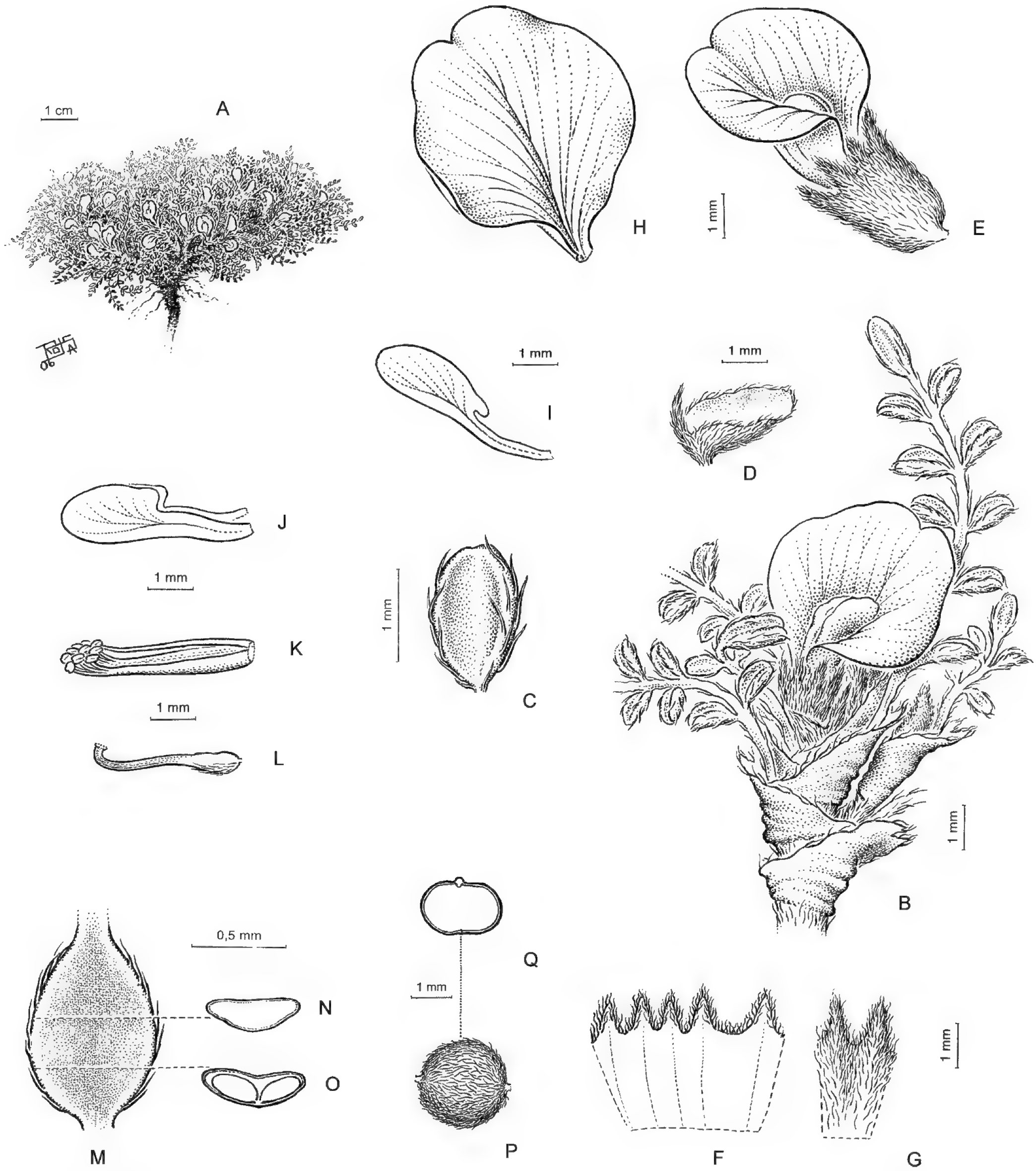

Figure 2. *Astragalus minimus* Vogel. —A. Plant habit. —B. Apex of branches with flower. —C. Leaflet, adaxial view. —D. Bract. —E. Flower. —F. Calyx, internal view. —G. Calyx, external view. —H. Banner, internal view. —I. Wing. —J. Keel. —K. Androecium. —L. Gynoecium. —M. Ovary. —N, O. Ovary, cross section. —P. Fruit. —Q. Fruit, cross section. Based on the holotype *Meyen 67* (P).

slightly compressed laterally, shortly apiculate-beaked, valves papery, obtuse at base and apex, inflexed below middle of pod, subbilocular, with a membranous septum to 0.7 mm wide; seeds 4 to 7, reniform, generally smooth.

Distribution and habitat. *Astragalus tacorensis* occurs in northern Chile and northwestern Argentina, in high mountains at elevations of 3700–4500 m. The type locality of Volcán Tacora, with a summit of 5988 m, is in northern Chile, in Parinacota Province, which is bordered to the north and west by Peru and to the east by Bolivia. Temperatures in the type locality are cool, averaging 4°C.

Werdermann collected in Chile and commented on the scarcity of cryptogamic plants in northern Chile versus plants with xeromorphic characteristics (Werdermann, 1931). He noted that the cold, dry wind

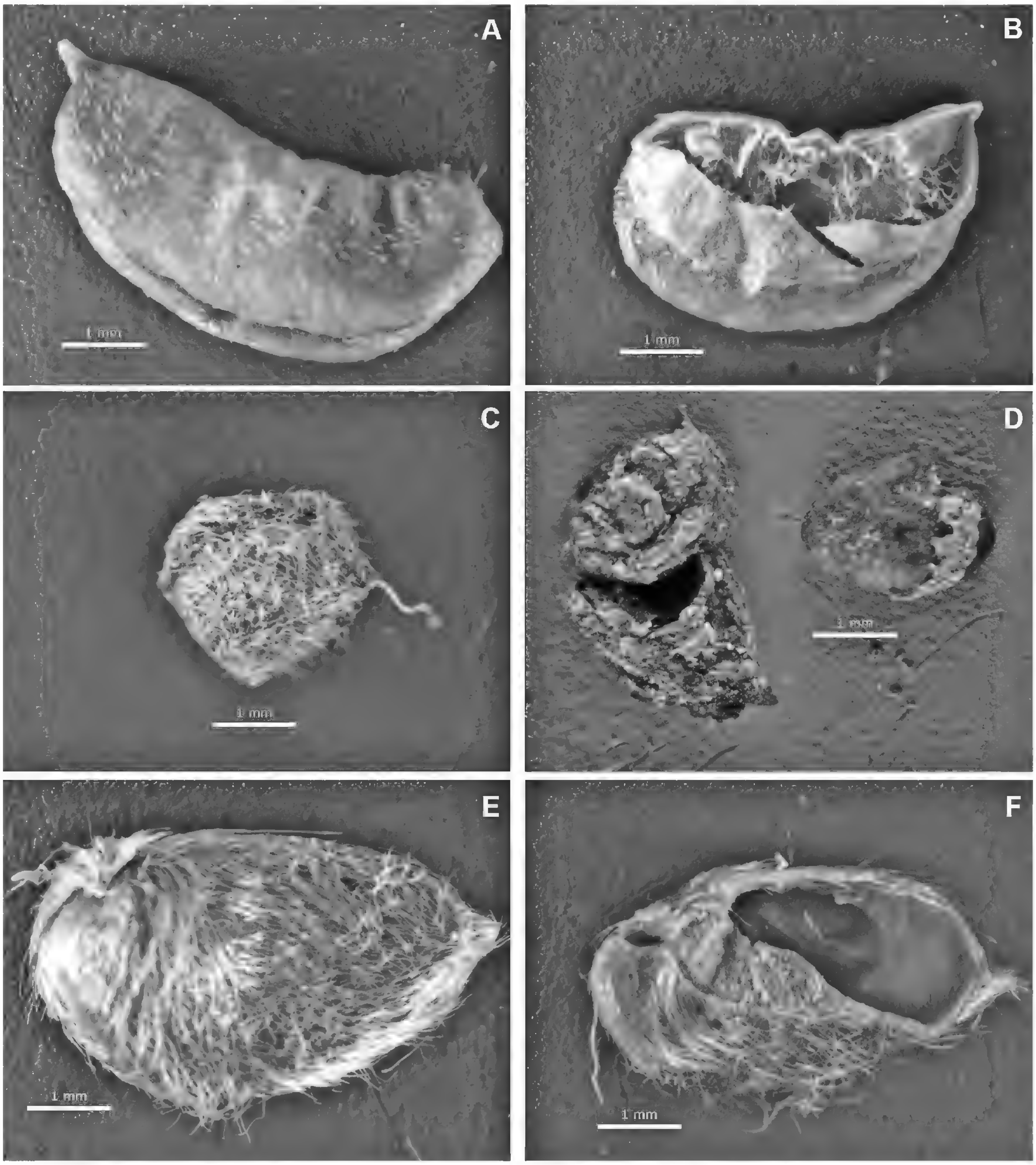

Figure 3. Fruit and seeds. A, B. *Astragalus tacorensis* Gómez-Sosa (from *Kiesling et al. 5291*, SI). —A. Intact fruit, lateral view. —B. Subbilocular fruit, longitudinal section showing the partial septa. C, D. *Astragalus minimus* Vogel (from *Vargas 8439*, SI). —C. Fruit, lateral view. —D. Evanescent fruit (left) and seed (right). E, F. *Astragalus peruvianus* Vogel (from *Gómez-Sosa 166*, SI). —E. Intact fruit, lateral view. —F. Fruit dissected to show the interior, lateral view. Scale bars = 1 mm.

necessitated a protective morphology, which is seen in plants with a smaller surface area and with a waxy, resinous, or pubescent protective covering to reduce transpiration. He also noted that conditions on the slopes of the inter-Andean valleys allowed the formation of extensive meadows, locally called vegas.

IUCN Red List category. *Astragalus tacorensis* is preliminarily evaluated as Vulnerable (VU) according to IUCN Red List criteria (IUCN, 2001) because of the taxon's small population that is potentially at risk.

Etymology. The specific epithet refers to the type locality of Volcán Tacora.

Paratypes. ARGENTINA. **Jujuy:** Yaví, Quebrada de Salitre, 22°7′48″S, 65°39′49″W, 3523 m, 23 Feb. 1940, *F. Meyer 31465* (LIL, SI); Rinconada, Mina Pirquita, 4300 m, 5–12 Mar. 1981, *H. Schwabe, E. Ancibor & A. Vizinis 729a*

Table 1. Comparison of *Astragalus tacorensis*, *A. minimus*, and *A. peruvianus*.

	A. tacorensis	*A. minimus*	*A. peruvianus*
Caudex and branches (cm)	1–1.5	(0.5–)1–2	(0.5–)1
Stipules	membranous, glabrous to glabrescent	membranous, glabrous	scarious, glabrous
Leaflets			
Number	9 to 15	(7)9 to 11	7 to 13
Size (mm)	(0.5–)1–2	1–1.5	1–1.2
Shape	oblong	elliptic to oblong	elliptic to ovate
Apex	retuse	obtuse	obtuse
Pubescence	fine and scattered abaxially and at margin	white villous abaxially, glabrous adaxially	silvery villous on both surfaces
Peduncle (cm)	ca. 0.5	0	0
Flowers			
Number	(1)2	1(2)	1(2)
Length (mm)	5.5–6.5	4–6(–8)	6–7
Ovules	8(to 10)	2	6
Legume	subbilocular, septate 3/4 from base	unilocular, not septate	subbilocular, septate at base
Length (mm)	6–7	2.5–3.5	4–5 × ca. 3
Consistency	papery	membranous-evanescent	tough (thick)
Pubescence	white strigulose	white villous	silvery villous
Seeds	4 to 7	1(2)	5

(SI); Humahuaca, 10 km from Cienzo to Santa Ana, Abra de Zenta, 23°10′S, 65°02′W, 4500 m, 12 Feb. 1998, *O. Morrone, N. Deginani, A. Cialdella & L. Giussani 2477a* (SI); Hornaditas, 20 Jan. 1976, *R. A. García 584* (SI); Tres Cruces, en vega [meadows], 3700 m, 4 Mar. 1997, *R. Erschb 9789* (Hb. Traer, SI); Tumbaya, El Moreno, Ciénaga Grande, 16 Feb. 1985, *R. Kiesling, S. Botta, C. Ezcurra, M. Sanchez & E. Ulibarri 5291* (MO, SI). **Salta:** San Antonio de los Cobres, 21 Feb. 1927, *A. Castellanos s.n.* (G, SI). **Tucumán:** Cumbres Calchaquíes, Huaca-Huasi, 4270 m, 26 Dec. 1977, *S. Halloy 866* (SI, TUC).

2. Astragalus minimus Vogel in Meyen, emend. Gómez-Sosa, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19(Suppl. 1). 1843. TYPE: Peru. Altos de Toledo, Apr. 1831, *F. J. Meyen 67* (holotype, P ex hb. Bunge-Berlin). Figures 2, 3C, D.

Depressed pulvinate herb, 2–5 cm diam., acaulescent, caudex (0.5–)1–2 cm, stoutly branched, stipules amplexicaul, membranous, hyaline, glabrous, ciliate. Leaves 4–8(–15) mm; leaflets (7)9 to 11, opposite, folded, in outline elliptic to oblong, thickened, apex obtuse, white villous abaxially, glabrous adaxially. Flowers 1(or 2), sessile, 4–6(–8) mm; bracts 1.5–2.5 mm, subulate, ciliolate, pubescent; calyx 2–3 mm, pubescent; banner 5–7 × 3.5–4.5 mm, with the claws very short and included, obovate to subcircular; wings and keel shorter than banner; ovary pubescent, style incurved at apex; ovules 2. Legume unilocular, 2.5–3.5 mm, subglobose, valves membranous, evanescent, concealed by persistent petals, bract, and stipule; seed 1(2), generally mottled.

Distribution. *Astragalus minimus* is a regional endemic to western South America and is possibly sympatric with *A. diminutivus* (Phil.) Gómez-Sosa, which also forms pulvinate cushions and is found in the Neotropical subregion and biogeographic province of Puna (Zarucchi, 1993; Gómez-Sosa, 2005, 2008).

The only location information noted for the Meyen type is vague ("Peru, Altos de Toledo"), and its exact collection locality is not known. Macbride (1943: 399) cited only "Puno: above Toledo" and Johnston (1947: 404) noted "Arequipa: Alto de Toledo"; both occur in southern Peru. The Arequipa–Puno area is between 16–18°S, 70–72°W.

Discussion. *Astragalus minimus* is similar to the pulvinate species *A. peruvianus* Vogel (Fig. 3E, F). *Astragalus minimus*, *A. peruvianus*, and *A. tacorensis* are compared in Table 1.

Additional specimens examined. ARGENTINA. **Jujuy:** Humahuaca, Abra de Aparzo, *N. Deginani et al. 405* (SI). BOLIVIA. **La Paz:** Charaña, *E. Asplund 6145* (US). CHILE. **Tarapacá:** Laguna Chungaró, *O. Zoellner 3044* (SI). PERU. **Arequipa:** Prov. Islay, lomas de Mollendo, *C. Vargas C. 8439* (SI).

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New Synonyms in *Hortia* and *Dictyloma* (Rutaceae), with Validation of the Name *Hortia badinii*

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Abstract. This work is a part of a taxonomic revision of the Neotropical genus *Hortia* Vand. (Rutaceae), where three names (*H. colombiana* Gleason, *H. chocoensis* Cuatrec., and *H. badinii* M. Lisboa ex Groppo) are proposed as synonyms of *H. brasiliana* Vand. ex DC., and the name *H. badinii* is here validated. Additionally, another name in the Rutaceae, *Dictyoloma peruvianum* Planch., is proposed as a synonym of *D. vandellianum* A. Juss. Notes on the type collection of *D. vandellianum* are provided.

Resumo. Este trabalho é parte de uma revisão taxonômica do gênero neotropical *Hortia* Vand. (Rutaceae), onde três binômios (*H. colombiana* Gleason, *H. chocoensis* Cuatrec. e *H. badinii* M. Lisboa ex Groppo) são propostos como sinônimos de *H. brasiliana* Vand. ex DC., com a validação do nome *H. badinii*. Adicionalmente, um nome na mesma família Rutaceae, *Dictyoloma peruvianum* Planch., é proposto como sinônimo de *D. vandellianum* A. Juss. São também fornecidas notas sobre a coleção-tipo de *D. vandellianum*.

Key words: *Dictyoloma*, *Hortia*, Neotropics, Rutaceae.

Hortia Vand. is a Neotropical genus of Rutaceae traditionally included in the subtribe Toddaliinae, subfamily Toddalioideae (Engler, 1931). Ten species are currently recognized in the genus; these are distributed from Panama to the state of São Paulo in Brazil, but most occur across Amazonia (Groppo et al., 2005). These taxa are trees or shrubs with simple leaves crowded near the apex of the branches; showy, wide corymbose terminal inflorescences; red to pink flowers; and a baccate fruit with abundant oil glands (Groppo et al., 2005; Groppo & Pirani, 2008). During the revision of the genus, three names, *H. colombiana* Gleason, *H. chocoensis* Cuatrec., and *H. badinii* M. Lisboa ex Groppo (validated here), are considered synonyms of *H. brasiliana* Vand. ex DC. Additionally, another name in the Rutaceae, *Dictyoloma peruvianum* Planch., is proposed as a synonym of *D. vandellianum* A. Juss.

Synonymy in *Hortia*

Hortia brasiliana Vand. ex DC., Prodr. (DC.) 1: 732. 1824. TYPE: Brazil. Minas Gerais: [probably near Mariana, see Groppo et al., 2005], s.d., s.n. (holotype, P-JU, photos [F neg. 35742] at IAN, MO).

Hortia colombiana Gleason, Phytologia 1: 25. 1933, syn. nov. TYPE: Colombia. Boyacá: Upper Chapón, 1500–1800 m, 5 Aug. 1932 (fl.), *A. E. Lawrance 392* (holotype, NY; isotypes, BM, F, F neg. 12677, GH, K, MO, MO photo at NY).

Hortia chocoensis Cuatrec., Brittonia 14: 54. 1962, syn nov. TYPE: Colombia. Chocó: Río Negro, betw. Quibdó & Tutunendo, 80 m, 4 Apr. 1958 (fl., fr.), *J. Cuatrecasas & Llano 24210* (holotype, US [3], photo at SPF; isotypes, COL, U, photo at SPF).

Hortia badinii M. Lisboa ex Groppo, sp. nov. *Hortia badinii* M. Lisboa, Revista Esc. Farm., Ouro Preto 3: 7. 1974, nom. inval. TYPE: Brazil. Minas Gerais: Mariana, Demerara, entre Santa Rita Durão e Bento Rodrigues, 14 May 1971 (fl.), *M. A. Lisboa s.n.* (holotype, OUPR 26959).

Discussion. In the description of *Hortia colombiana*, Gleason (1933) commented that his new species was very similar to *H. brasiliana*, a name erroneously applied to a shrubby species from the Brazilian savannas (cerrados), for which the correct name is *H. oreadica* Groppo, Kallunki & Pirani. The name *H. brasiliana* is today properly applied to an arborescent species from eastern Brazil (see Groppo et al., 2005). The characteristics used by Gleason to differentiate *H. colombiana* from *H. brasiliana* included the relatively larger flowers, the petiolate leaves, and the inflorescences without bracts. The shape and measurements of the leaves and petiole of the type of *H. colombiana* (*Lawrance 392*) fall within the range of variation of these characteristics encountered in other collections of *H. brasiliana* from Colombia, Ecuador, Bolivia, Panama, and Brazil. The lack of bracts in the inflorescences of *H. colombiana* reported by Gleason (1933) was not confirmed when the type of this species was examined.

Cuatrecasas (1962), in turn, compared his *Hortia chocoensis* with *H. brasiliana*, the former differing from the latter mainly by the more evident venation, the possession of petiolate leaves, and the smaller,

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obtuse bracts of the inflorescences. Our analysis of the type of *H. chocoensis* (*Cuatrecasas & Llano 24210*) and other collections from Chocó, Colombia, demonstrated that the distinct features of *H. chocoensis* fall within the morphological variation of *H. brasiliana*.

Hortia badinii was described by Lisboa (1974) on the basis of his material collected in Mariana (type) as well as from other exsiccatae from Mariana and Ouro Preto, Minas Gerais, Brazil, and deposited at OUPR (*Badini et al. s.n.*, OUPR 7676, OUPR 22467, and others). According to Lisboa, the name *H. badinii* was applied to individuals of *Hortia* with whitish (rather than pinkish) trichomes on the inner surface of the petals. Evident trichomes on the inner surface of the petals are encountered in all species of *Hortia*, with the exception of *H. nudipetala* Groppo (Groppo & Pirani, 2005). The color of these trichomes can vary from pink to white in fresh flowers of *H. brasiliana*, and morphological analyses and field observations of individuals in the type locality (Mariana, Minas Gerais, Brazil) showed that this species does not merit recognition and is here considered as synonymous with *H. brasiliana*.

Lisboa (1974) did not clearly indicate a collection as the type of his new species *Hortia badinii*, and consequently the name was not validly published. Instead, he states that the holotype was collected near Santa Rita Durão, district of Demerara (a locality in Mariana, Minas Gerais), and was deposited at OUPR. Among the examined collections from OUPR there is one sheet collected by Lisboa himself (*Lisboa s.n.*, OUPR 26959) that is assigned as the holotype of *H. badinii* in sched. This material is here considered to be the holotype of this species and the name is validated here.

Synonymy in *Dictyoloma*

Dictyoloma vandellianum A. Juss., Mém. Mus. Hist. Nat. 12: 499, t. 24 [June] 1825, nom. cons. TYPE: Brazil. [presumed Minas Gerais], s.d., s.n. (holotype, P-JU).

Dictyoloma peruvianum Planch. in Hook., Lond. J. Bot. 5: 583. 1846, syn. nov. TYPE: Peru. s.d., *Mathews 1657* (holotype, K [2]).

Discussion. *Dictyoloma* A. Juss. is the sole genus within the subfamily Dictyolomatoideae of the Rutaceae, as defined by Engler (1931). The genus is currently recognized with two species (e.g., Pirani, 2002), *D. vandellianum*, from eastern Brazil (states of Bahia, Minas Gerais, Espírito Santo, Rio de Janeiro, and São Paulo), and *D. peruvianum*, from western South America, including Peru, Ecuador, Bolivia, Argentina (Corrientes Province), and Brazil (states of Acre, Amazonas, Rondônia, and Pará). The two names *D. vandellianum* and *D. peruvianum* are commonly identified in herbaria mainly by their apparent disjunctive geographic distribution rather than the existence of a clear morphological variation. The most striking difference between the types of both names is in the leaves: the type of *D. peruvianum* (*Mathews 1657*) bears leaves with entire, narrower foliolules up to 4.2 × 0.6 cm, which contrasts with the type of *D. vandellianum* deposited at P, which has crenate and wider foliolules (up to 4 × 1.8 cm). Fieldwork carried out in Brazil (states of Bahia, Espírito Santo, and Minas Gerais) has demonstrated, however, that leaves with crenulate or entire foliolules can be found within a single population of *Dictyoloma*, and even within the same individual. Collections with entire or crenulate leaves can be found throughout the geographic range described for these two names. Given this lack of an evident morphological distinction and existence of this morphological continuum, *D. peruvianum* is synonymized under the older name *D. vandellianum*.

In the type collection of *Dictyoloma vandellianum* deposited at P (Jussieu herbarium), there is a small label noting that the material was sent by Vandelli from Lisboa to Jussieu in 1790. It is very likely that the specimen on which Jussieu based his description of *D. vandellianum* was among botanical collections made in Brazil by Joaquim Vellozo (or Veloso) de Miranda, correspondent of the Royal Academy of Sciences (Portugal), who lived in Mariana (Minas Gerais State) in the late 1700s (Urban, 1906: 128). Vellozo sent many botanical collections from Brazil to Vandelli, which were subsequently forwarded to Jussieu, as is the case for the type collection of *Hortia brasiliana* (see Groppo et al., 2005). Thus, the type collection of *D. vandellianum* deposited at P was presumably made near or in Mariana, Minas Gerais State, Brazil, a locality well within the range of the geographic distribution of this species.

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Two New Species of Gentianaceae from Northwestern Yunnan, China

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Abstract. Two narrowly endemic species of Gentianaceae from northwestern Yunnan Province in China, *Gentiana spathulisepala* T. N. Ho & S. W. Liu and *Swertia lihengiana* T. N. Ho & S. W. Liu, are described, illustrated, and compared with their closest relatives. Keys are also provided for the allied species of *G. spathulisepala* and *S. lihengiana*, respectively.

Key words: China, *Gentiana*, Gentianaceae, IUCN Red List, *Swertia*.

The Gentianaceae, with about 1600 species (Struwe & Albert, 2002), have a cosmopolitan distribution. They are represented in China by 419 species (Ho & Pringle, 1995). During the study of recent collections of the Gentianaceae from northwestern Yunnan Province in China, two new species were identified and are described here.

Gentiana spathulisepala T. N. Ho & S. W. Liu, sp. nov. TYPE: China. Yunnan: Zhongdian, Xianren-dong, in alpine meadows, 3200 m, Oct. 1982, *Lü Zheng-wei 82-130* (holotype, KUN; isotype, KUN). Figure 1.

Haec species *Gentianae suborbisepalae* C. Marquand et *G. tongolensi* Franch. affinis, sed ab ambabus corolla azureo-purpurea late atropurpureo-vittata plerumque infundibuliformi ad faucem (9–)10–12 mm lata, staminibus inclusis tubi corollae basin versus sed infra medium insertis atque filamentis 13–15 mm longis, a hac corollae plicis symmetricis atque floribus 2 vel 3 in fasculos terminales dispositis, ab illa staminibus aequalibus atque stylo ovario fere aequilongo differt; etiam *G. delavayi* Franch. aliquanto similis, sed ab ea foliis spathulatis usque obovatis atque lobis calycis aequalibus orbiculato-spathulatis vel suborbiculatis bene distincta.

Biennials, 5–7 cm tall; roots slender, yellow, woody; stems ascending, purple, densely purple papillate, much branched from base, with laxly prostrate branches. Basal leaves in a rosette, sometimes withered at anthesis; petioles 1.5–2.5 mm; leaf blade spatulate to obovate, 4–10 × 2–4 mm, apex obtuse to rounded, base narrowed, midvein distinct; stem leaves in 2 to 4 pairs, mostly crowded and surrounding base of flowers, spatulate, 10–22 × 2.5–7 mm, including petiole, apex rounded, margin cartilaginous and scabrous, veins 3, abaxially distinct, base contracted. Flowers 2 or 3 at the stem apex, crowded in clusters, sessile or subsessile, 5-merous. Calyx 12–17 mm; calyx tube membranous, narrowly obconic; lobes equal, orbiculate-spatulate, 5–7 mm, apex rounded and cuspidate, margin cartilaginous and scabrous, base contracted into a broad tongue, midvein prominent; corolla funnelform, rarely tubular, 22–28 × (9–)10–12 mm (width at throat), blue-purple, outside with broad dark purple stripes; lobes ovate, 4–5 × 1.5–2 mm, apex acute; plicae ovate, 1.5–2 mm, entire; stamens inserted at basal part of corolla tube; filaments 13–15 mm, linear; anthers 2–2.2 mm, ellipsoid; style 8–10 mm, ca. as long as ovary, linear; stigma lobes oblong. Capsules included, 12–14 mm, narrowly ellipsoid; gynophore to 8 mm; seeds 0.6–0.8 mm, ellipsoid, dark brown; seed coat alveolate, with simple shallow hexagonal pits.

Distribution and habitat. *Gentiana spathulisepala* is known only from the type collection. It is endemic to northwestern Yunnan Province in China, where it occurs in alpine meadows at an altitude of 3200 m.

IUCN Red List category. Due to the rarity and limited distribution of *Gentiana spathulisepala*, this species is assessed here as Endangered (EN) according to the IUCN Red List criteria Blab(i,ii,iii) (IUCN, 2001).

Etymology. The specific epithet is from the Latin, in reference to the orbiculate to spatulate calyx lobes.

Relationships. *Gentiana spathulisepala* is similar to *G. suborbisepala* C. Marquand and *G. tongolensis* Franch., but differs from both taxa by its blue-purple corolla with broad, dark purple stripes. The corolla is funnelform, (9–)10–12 mm wide at the throat; the stamens are inserted at the basal part of the corolla tube and are included; and the stamen filaments are 13–15 mm long. The new species also differs from *G. suborbisepala* by the stamens being equal and by the style that is approximately as long as the ovary. *Gentiana spathulisepala* differs from *G. tongolensis* by the symmetrical and entire plicae and the inflorescences in 2- to 3-flowered clusters. *Gentiana spathulisepala* is somewhat similar to *G. delavayi* Franch. in the corolla color and shape, but is easily distinguished by its spatulate to obovate leaves and orbiculate-spatulate calyx lobes. *Gentiana spathulisepala* may be

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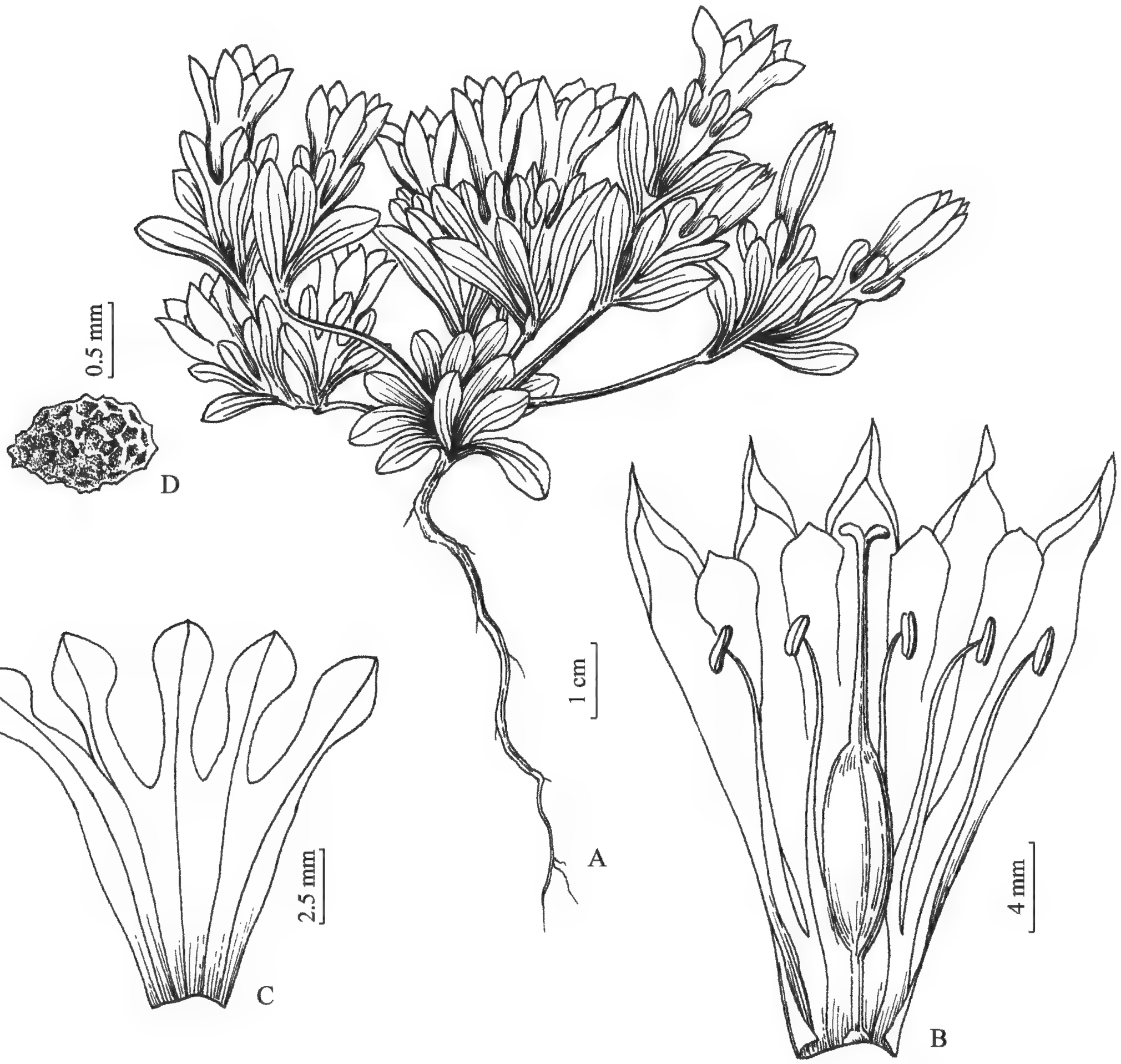

Figure 1. *Gentiana spathulisepala* T. N. Ho & S. W. Liu. —A. Plant. —B. Opened corolla. —C. Opened calyx. —D. Seed. Drawn from the holotype *Lü Zheng-wei 82-130* (KUN).

distinguished from its allied species by the following key.

KEY TO SPECIES ALLIED TO *GENTIANA SPATHULISEPALA* IN CENTRAL CHINA

1a. Leaf blades narrowly elliptic to lanceolate; calyx lobes slightly unequal, oblanceolate, obtuse at both ends; corolla (15–)28–40 mm long; northwestern and northeastern Yunnan, southwestern Sichuan . . . . . *G. delavayi*

1b. Leaf blades spatulate to obovate; calyx lobes equal, orbiculate-spatulate or suborbiculate, apex rounded, base contracted; corolla 20–30 mm long.

2a. Corolla blue-purple, with broad, dark purple stripes, usually funnelform, (9–)10–12 mm wide at throat; stamens equal, inserted at basal part of corolla tube, included, filaments 13–15 mm long; northwestern Yunnan . . . . . *G. spathulisepala*

2b. Corolla pale yellow or to pale blue, usually with blackish streaks and spots, not funnelform, 5–8 mm wide at throat; stamens equal or unequal, inserted at middle of corolla tube, usually exserted, filaments 5–9 mm long.

3a. Stamens unequal; plicae symmetrical, broadly ovate, slightly 2-cleft or denticulate; style shorter than ovary; flowers in terminal and axillary clusters; northeastern Yunnan, southwestern and western Sichuan, western Guizhou . . . . . *G. suborbisepala*

3b. Stamens equal; plicae extremely oblique, auriculate to triangular, entire; style as long as to longer than ovary; flowers solitary at ends of branches; eastern Xizang, northwestern Yunnan, western Sichuan . . . . . *G. tongolensis*

Swertia lihengiana T. N. Ho & S. W. Liu, sp. nov. TYPE: China. Yunnan: Gongshan, Dulongjiang, Lenben pass, 1300 m, on sandy places of riverbanks, 19 Nov. 1990 (fl.), *Dulongjiang*

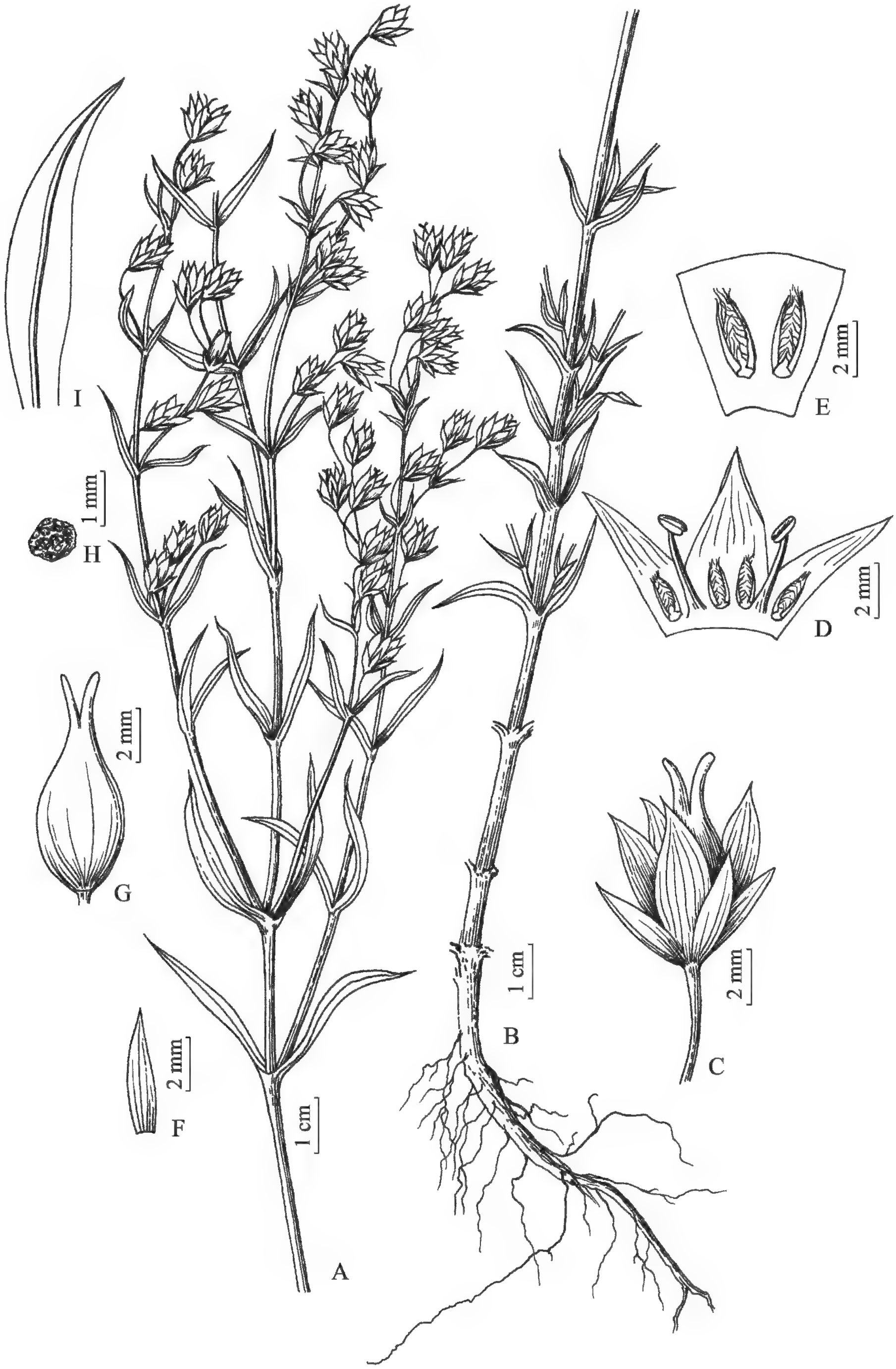

Figure 2. *Swertia lihengiana* T. N. Ho & S. W. Liu. —A. Flowering branch. —B. Basal portion of plant. —C. Flower. —D. Opened corolla. —E. Nectaries. —F. Calyx lobe. —G. Capsule. —H. Seed. —I. Leaf. Drawn from the holotype *Dulongjiang Expedition 545* (KUN).

Expedition 545 (holotype, KUN; isotype, CAS). Figure 2.

Haec species *Swertiae chirayitae* (Roxb. ex Fleming) H. Karst. et *S. luridae* (D. Don) C. B. Clarke similis, sed ab ambabus foliis caulinis lineari-lanceolatis usque linearibus base attenuatis, lobis calycis lineari-lanceolatis atque lobis corollae apice acuminatis caudatisque, a hac corolla purpurea 5–7 mm longa bene distincta.

Annuals, 60–70 cm tall, glabrous; stems erect, distinctly edged, branched from middle. Basal leaves in 2 or 3 pairs, withered at anthesis; petioles 2–3 cm; leaf blades narrowly elliptic, 2–4 × 0.2–0.3 cm, apex obtuse, base narrowed, midvein distinct; stem leaves in 7 to 10 pairs, sessile, 2.5–6.5 × 0.2–0.5 cm, smaller toward stem apex, linear-lanceolate to linear, apex acute, margin revolute, veins 3, abaxially distinct, base narrowed and narrowly decurrent along stem. Inflorescences as panicles of cymes, lax, many-flowered, spreading branched; pedicels 4–18 mm. Flowers 4-merous; calyx and corolla rotate, lobed to near base; calyx 3.5–5 mm; lobes linear-lanceolate, slightly unequal, apex subacute, margin entire, midvein prominent; corolla 5–7 mm, pale purple; lobes elliptic, apex acuminate and shortly caudate; nectaries on corolla lobes, 2 per lobe, oblong, radially elongated, with a narrow marginal scale, raised with many long fimbriae; stamens with the filaments linear, 3.2–3.5 mm; anthers ellipsoid, 1–1.2 mm; style 1–1.2 mm, linear; stigma lobes oblong. Capsules sessile, ovoid to ovoid-ellipsoid, 5–6 mm; seeds subglobose, 0.5–0.6 mm diam., brown; seed coat finely reticulate.

Distribution and habitat. *Swertia lihengiana* is endemic to northwestern Yunnan Province in China and is known only from the type localities, with two populations of 30 to 50 plants. It occurs in evergreen forests or on sandy riverbanks at elevations between 1300 and 1400 m.

IUCN Red List category. Due to the rarity and limited distribution of *Swertia lihengiana*, this species is assessed here as Endangered (EN) according to the IUCN Red List criteria Blab(i,ii,iii) (IUCN, 2001).

Etymology. *Swertia lihengiana* is named after Li Heng at the Kunming Institute of Botany, Chinese Academy of Sciences, in appreciation of her great contribution to phytotaxonomy and phytogeography in China and in recognition of the Dulongjiang Expedition where she first collected this new species.

Relationships. *Swertia lihengiana* resembles the Himalayan species *S. chirayita* (Roxb. ex Fleming) H. Karst. and *S. lurida* (D. Don) C. B. Clarke, but differs from both by the linear-lanceolate to linear stem leaves with the base narrowed, the lanceolate calyx lobes, and the acuminate and shortly caudate corolla lobes. It further differs from *S. lurida* by the purple corolla that is 5–7 mm long. *Swertia lihengiana* may be distinguished from these allied species by the following key.

Key to Species Allied to *Swertia lihengiana* in China and Adjacent Himalayan Regions

1a. Stem leaves linear-laneolate to linear, base narrowed; calyx lobes linear-lanceolate; corolla lobes acuminate and shortly caudate; northwestern Yunnan, China . . . . . *S. lihengiana*
1b. Stem leaves ovate-triangular to ovate-elliptic, base cordate to orbiculate, ± amplexicaul; calyx lobes ovate; corolla lobes acute.
  2a. Flowers smaller: calyx lobes 0.5–2 × 0.5–1 mm, corolla lobes 2–3 × 1–1.5 mm; Kashmir, Nepal, India . . . . . *S. lurida*
  2b. Flowers larger: calyx lobes 3–5 × 1–2 mm, corolla lobes 4–7 × 1.5–3 mm; Nepal, eastern India, Sikkim . . . . . *S. chirayita*

Paratype. CHINA. **Yunnan:** Gongshan, Dulongjiang, Dandangwanggo, in evergreen forests, 1400 m, 19 Jan. 1991 (fr.), *Dulongjiang Expedition 3323* (KUN).

Acknowledgments. We are much indebted to Sun Han and Zhan Yan at the herbarium of the Kunming Institute of Botany, Chinese Academy of Sciences, for arranging specimen loans. We are grateful to Wang Yin and Li Ai-li for drawing the illustrations. We also thank the reviewer, Bernhard von Hagen, and the scientific editor, Victoria C. Hollowell, for numerous minor corrections and suggestions that improved the paper.

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New Combinations in *Schoenoplectus* (Cyperaceae) from China

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ABSTRACT. Five new combinations in *Schoenoplectus* (Rchb.) Palla (Cyperaceae) are proposed for taxa occurring in China. All these taxa previously had been placed in *Scirpus* L. s.l., which has been split into segregate genera in the recent literature. The following transfers are made for taxa originally described from China: *Schoenoplectus chuanus* (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, its type from Jiangsu; *S. jingmenensis* (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, from Hubei; *S. monocephalus* (J. Q. He) S. Yun Liang & S. R. Zhang, from Anhui; *S. pseudoarticulatus* (L. K. Dai & S. M. Huang) S. Yun Liang & S. R. Zhang, from Hainan; and *S. supinus* (L.) Palla subsp. *densicorrugatus* (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, from Xinjiang.

Key words: China, Cyperaceae, *Schoenoplectus*, *Scirpus*.

The genus *Scirpus* L. (Cyperaceae) has been demonstrated to be heterogeneous, and it has been split into segregate genera (Wilson, 1981; Haines & Lye, 1983; Zhan & Yang, 1987a, b, c; Bruhl, 1995; Goetghebeur, 1998; Kukkonen, 1998; Muasya et al., 1998, 2000, 2001; Smith & Hayasaka, 2001, 2002; Pignotti & Mariotti, 2004). Although previously treated as a single genus in *Flora Reipublicae Popularis Sinicae* (Tang & Wang, 1961), Chinese *Scirpus* s.l. segregates into the six genera *Actinoscirpus* (Ohwi) R. W. Haines & Lye, *Bolboschoenus* (Asch.) Palla, *Isolepis* R. Br., *Schoenoplectus* (Rchb.) Palla, *Scirpus*, and *Trichophorum* Pers. This follows the scheme of Goetghebeur's 1998 classification and will correspond to our treatment of the Cyperaceae for the *Flora of China*.

Accordingly, five taxa from *Scirpus* s.l. distributed in China are transferred here into *Schoenoplectus* as new combinations. Four of these taxa (*Scirpus chuanus* Tang & F. T. Wang, *S. jingmenensis* Tang & F. T. Wang, *S. monocephalus* J. Q. He, and *S. pseudoarticulatis* L. K. Dai & S. M. Huang) were previously considered in *Scirpus* but are all characterized by a group of morphological traits (stolon presence, tuber presence, nodeless culms, culm-like bracts, and pseudolateral inflorescences) that currently delimit *Schoenoplectus* (Wilson, 1981; Smith & Hayasaka, 2001).

1. Schoenoplectus chuanus (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, comb. nov. Basionym: *Scirpus chuanus* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 222. 1961. TYPE: China. Jiangsu: Nanjing, watery places, 17 Aug. 1931, *K. L. Chu 341* (holotype, PE).

Distribution. *Schoenoplectus chuanus* is only known from Jiangsu, China.

Specimen examined. CHINA. **Jiangsu:** Jurong, *M. B. Deng 3640* (PE).

2. Schoenoplectus jingmenensis (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, comb. nov. Basionym: *Scirpus jingmenensis* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 222. 1961. TYPE: China. Hubei: Jingmen, 27 Sep. 1940, *H. Migo s.n.* (holotype, PE).

Distribution. *Schoenoplectus jingmenensis* is only known from Hubei, China.

Specimen examined. CHINA. **Hubei:** Jingmen, s.d., *H. Migo s.n.* (PE).

3. Schoenoplectus monocephalus (J. Q. He) S. Yun Liang & S. R. Zhang, comb. nov. Basionym: *Scirpus monocephalus* J. Q. He, Acta Phytotax. Sin. 37(3): 291, f. 1. 1999. TYPE: China. Anhui: Fuyang, riversides, 8 June 1994, *J. Q. He & X. L. Hou 5438* (holotype, Herbarium of Resources Plants, Anhui University not seen).

Distribution. *Schoenoplectus monocephalus* is only known from Anhui, China.

Specimen examined. CHINA. **Anhui:** Fuyang, *J. Q. He 5493* (PE).

4. Schoenoplectus pseudoarticulatus (L. K. Dai & S. M. Huang) S. Yun Liang & S. R. Zhang, comb. nov. Basionym: *Scirpus pseudoarticulatus* L. K. Dai & S. M. Huang, Fl. Hainan. 4: 538. 1977. TYPE: China. Hainan: Yiaxian, 19–29 May 1935, *S. K. Lau 5746* (holotype, IBSC).

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Distribution. *Schoenoplectus pseudoarticulatus* is known from Hainan, China, and also occurs in India. No specimens other than the type were seen, and the distributional information is taken from *Flora Hainanica* (Anonymous, 1977).

5. Schoenoplectus supinus (L.) Palla, Bot. Jahrb. Syst. 10: 299. 1888. Basionym: *Scirpus supinus* L., Sp. Pl. 1: 49. 1753. TYPE: France. Paris: *Hb. Tournefort 5117* (neotype, designated by Raynal, 1976: 145, P-TRF not seen).

5a. Schoenoplectus supinus subsp. **supinus**.

Distribution. *Schoenoplectus supinus* subsp. *supinus* is distributed in Europe, North Africa, Turkey, the Caucasus, southern Siberia, Kazakhstan, Iran, Pakistan, and East Asia, but is not found in China.

Discussion. Subspecies *supinus* is characterized by its larger spikes (5–12 mm) and the conspicuously transversely rugulose nut surface.

5b. Schoenoplectus supinus subsp. **densicorrugatus** (Tang & F. T. Wang) S. Yun Liang & S. R. Zhang, comb. et stat. nov. Basionym: *Scirpus supinus* var. *densicorrugatus* Tang & F. T. Wang, Fl. Reipubl. Popularis Sin. 11: 223. 1961. TYPE: China. Xinjiang: s. loc., 7 Sep. 1956, *R. C. Ching 786* (holotype, PE).

Distribution. *Schoenoplectus supinus* subsp. *densicorrugatus* is only known from Xinjiang, China.

Discussion. There are several infraspecific taxa within *Schoenoplectus supinus*, but only two occur in China: *S. supinus* subsp. *lateriflorus* (J. F. Gmel.) Soják and *S. supinus* subsp. *densicorrugatus*. The latter was originally described at varietal rank, differing from subspecies *supinus* by its smaller spikes (3–6 mm) and more densely and finely rugulose nut surface. The rank of subspecies is applied here in order to be consistent with taxonomic precedence otherwise recognized within the species.

Specimens examined. CHINA. **Xinjiang:** s. loc., *R. C. Ching 786* (PE).

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Two New Species of *Saussurea* (Asteraceae) from the Qinghai-Xizang Plateau, China

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ABSTRACT. *Saussurea sugongii* S. W. Liu & T. N. Ho and *S. bartholomewii* S. W. Liu & T. N. Ho (Asteraceae) are described from the Qinghai-Xizang Plateau, China. The two new species are illustrated and compared with their closest relatives.

Key words: Asteraceae, China, IUCN Red List, Qinghai-Xizang Plateau, *Saussurea*.

Saussurea DC., with about 400 species, is widely distributed in the temperate zones of Europe, Asia, and North America. The highest diversity of species exists in China, where 264 species are found (Shih & Jin, 1999). Throughout its geographic range, *Saussurea* may be found in various habitats to altitudes of 5700 m. Four botanical expeditions to the Qinghai-Xizang Plateau in China included two in southwestern Qinghai Province in 1993 and 1996 and two in the Kunlun Mountains in 1987 and 1988. These expeditions yielded two taxa quite different from previously described species of *Saussurea*. They are presented here as new species and are named after the collectors of the type specimens, Bruce Bartholomew and Su-gong Wu, in appreciation of their contributions to taxonomy and floristics in the Qinghai-Xizang Plateau.

1. **Saussurea bartholomewii** S. W. Liu & T. N. Ho, sp. nov. TYPE: China. Qinghai: Yushu, Jianxigou forestry station, 32°8′N, 97°2′E, 3620 m, in *Picea* forests, 28 Aug. 1996, *Ho Ting-nong, B. Bartholomew & M. G. Gilbert 2583* (holotype, HNWP; isotypes, CAS, GH). Figure 1A–D.

Haec species *Saussureae comptae* Franch. affinis, sed ab ea foliis obovato-lanceolatis vel oblanceolatis supra glanduloso-pubescentibus subtus sparse arachnoideis, illis medianis lyratis segmentis 1- vel 2-binatis, illis superis integris vel dentatis, calathiis numerosis, involucro tubuloso-campanulato, phyllariis extimis et medianis ovatis vel ovato-oblongis apice obtuso-rotundatis atque pappo biseriato setis fere aequilongis valde differt.

Perennials, 7–9 cm tall; rhizomes short; stems erect, striate, sparsely white arachnoid and glandular-pubescent, branched, caudex covered with fibrous remains of old leaf bases. Leaves cauline; petioles 3–4 cm, slender, sparsely white arachnoid and glandular-pubescent, base slightly decurrent; leaf blade obovate-lanceolate to oblanceolate, adaxially green, glandular-pubescent, abaxially glaucous, sparsely white arachnoid, penniveined, midvein prominent; basal leaves withered at anthesis; median leaf blade lyrate, 4–6 × 1.8–2.3 cm, terminal segment large, apex obtuse, margin dentate, the lateral ones 1 or 2 pairs, triangular, apex acute; upper leaf blade 2–5 × 0.4–2 cm, margin entire or dentate. Capitula many, cymose-corymbose at ends of stem and branches; peduncles 5–12 mm, having the same indumentum as the stems; involucre tubular-campanulate, 12–15 × 7–9 mm; involucral bracts arranged in 5 or 6 rows; exterior and median bracts ovate or ovate-oblong, 3–10 mm, apex obtuse-rounded and white lanate, abaxially almost glabrous, interior bracts lanceolate, to 15 mm, apex obtuse or acute and densely tomentose, abaxially white villose on the upper half; receptacular palea white, membranous, subulate, ca. 1.5 mm. Florets tubular, 12–13 mm, blue-purple, tube ca. 7 mm; anther tails white floccose-lanate. Achenes (immature) cylindric, ca. 3 mm, glabrous, punctate, 4-ribbed, apex coronate; pappus biseriate; interior setae 10–12 mm, pale brown or white, plumose, connate at base in a ring; exterior setae white, scabrous, deciduous, most setae as long as interior ones but with a few shorter.

Distribution and habitat. *Saussurea bartholomewii* is known only from the type collection. It is endemic to Yushu Xian of Qinghai Province, China, where it occurs in spruce forests (*Picea* A. Dietr.) at elevations ca. 3620 m.

IUCN Red List category. Due to the rarity and limited distribution of *Saussurea bartholomewii*, this species is assessed here as Endangered (EN) according to the IUCN Red List criteria EN Blab(i,ii,iii) (IUCN, 2001).

Etymology. This new species is named after Bruce Bartholomew, a taxonomist and phytogeographer in the Department of Botany, California Academy of Sciences.

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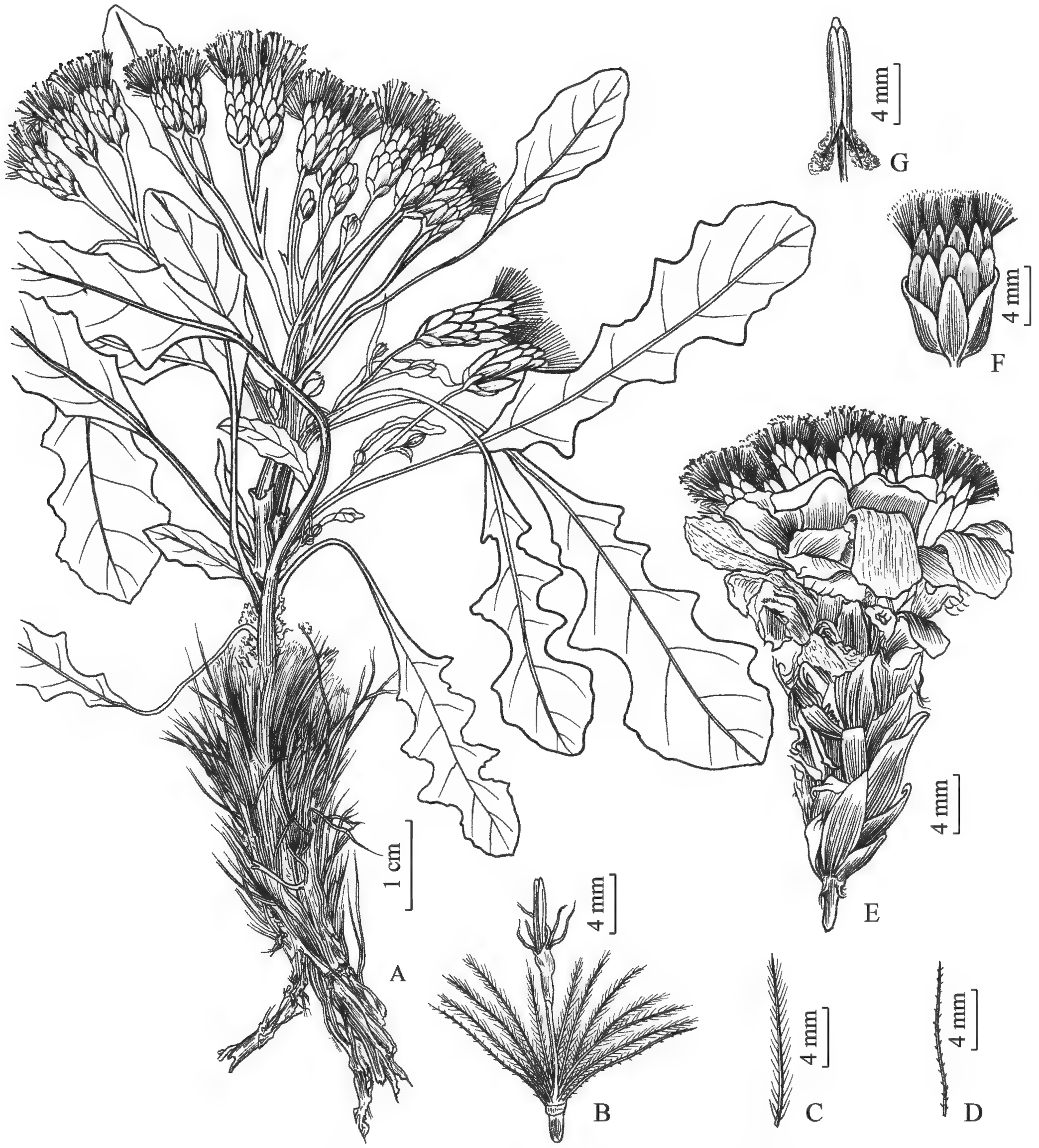

Figure 1. A–D. *Saussurea bartholomewii* S. W. Liu & T. N. Ho. (Drawn from the holotype *T. N. Ho et al. 2583*, HNWP). —A. Fertile plant. —B. Floret. —C. Inner seta of pappus. —D. Outer seta of pappus. E–G. *Saussurea sugongii* S. W. Liu & T. N. Ho. (Drawn from the holotype *S. G. Wu 2725*, KUN). —E. Fertile culm. —F. Capitulum. —G. Anther.

Relationships. *Saussurea bartholomewii* is closely related to *S. compta* Franch., but differs by the leaves that are obovate-lanceolate to oblanceolate, adaxially glandular-pubescent, and abaxially sparsely white arachnoid and the median leaves that are lyrate with lateral segments in one or two pairs. The new species is also distinguished in having upper leaves that are entire or dentate, numerous capitula, a tubular-campanulate involucre, ovate or ovate-oblong exterior and median bracts with an obtuse-rounded apex, floccose-lanate anther tails, a biseriate pappus, and exterior setae that are mostly as long as the interior ones. *Saussurea compta* has leaves that are abaxially scabrous, sparsely hispid, densely white tomentose, and adaxially green, with the basal and lower stem leaves withered at anthesis; shortly petiolate middle stem leaves with a narrowly elliptic and pinnatisect leaf blade; lateral segments in two or three pairs, oblong, lanceolate, or narrowly triangular, with the blade margin entire or 1-lobed only at one side or 1-lobed on each side, and the apex acute to obtuse; caudate terminal segments; upper stem leaves that are

sessile or subsessile, similar to the middle stem leaves, and gradually smaller apically on the stem; fewer capitula; an obconic-oblong involucre with the bracts in six rows; ovate outer bracts that are apically pubescent with an acute to obtuse apex; elliptic middle phyllaries that are apically sparsely pubescent with an obtuse apex; narrowly linear-elliptic inner bracts with a sparsely villous margin and an obconic-oblong apex; floccose-lanate anther tails; a biseriate pappus; and exterior setae that are shorter than the interior ones.

2. Saussurea sugongii S. W. Liu & T. N. Ho, sp. nov. TYPE: China. Xizang: Baingoin, S side of Muztagae mtn. pass, in gravel zone on high mtns., 5200 m, 19 Aug. 1988, *S. G. Wu 2725* (holotype, KUN; isotype, MO). Figure 1E–G.

Haec species *Saussureae glaciali* Herder et *S. gnaphalodi* (Royle) Sch. Bip. affinis, sed a hac phyllariis purpureis glabris, ab illa foliis basalibus obovatis suborbiculatis spathulatis vel flabellatis, supra glabris, subtus dense albo-tomentosis, ab ambabus setis pappi 1-seriatis flavido-brunneolis recedit.

Perennials, 1.5–2 cm tall; rhizomes slender, dark brown to blackish; stems short, base covered with remains of old leaf petioles. Leaves basal and cauline, crowded into a rosette; petioles of upper leaves slender and long, leaf blades orbicular, reduced to 1–2 mm diam.; petioles of upper leaves ca. 1 × 0.4 cm, purple, glabrous, base vaginate-amplexicaul, leaf blades ovate, flabelliform, spatulate to suborbicular, 3–6 × 2–5 mm, apex rounded and dentate, margin entire, base cuneate and narrowed, adaxially glabrous, abaxially densely white tomentose. Capitula 3 to 6, sessile, crowded into a hemispheric shape, 1–2 cm diam., surrounded by rosulate leaves; involucre narrowly campanulate, 3–6 × 3–4 mm; involucral bracts purple, membranous, glabrous, apex acuminate and dentate, arranged in 2 or 3 rows; exterior bracts narrowly elliptic, to 2 mm wide, broader than interior bracts, narrowed at both ends; interior bracts narrowly elliptic, sometimes narrowly oblanceolate; receptacle naked. Florets tubular, 6–8 mm, purple, tube as long as limb. Achenes (immature) glabrous; pappus uniseriate, with setae as long as florets, pale yellow-brown, plumose, arranged in one row.

Distribution and habitat. *Saussurea sugongii* is known only from the type collection and is endemic to the Kunlun Mountains in Xizang, China. It occurs in gravelly soils at elevations between 4950 and 5400 m.

IUCN Red List category. Due to the rarity and limited distribution of *Saussurea sugongii*, this species is assessed here as Endangered (EN) according to the IUCN Red List criteria EN Blab(i,ii,iii) (IUCN, 2001).

Etymology. This new species is named in honor of Wu Su-gong, a phytotaxonomist and phytogeographer at the Kunming Institute of Botany, Chinese Academy of Sciences.

Relationships. *Saussurea sugongii* is similar to *S. glacialis* Herder and *S. gnaphalodes* (Royle) Sch. Bip., but differs from both by its uniseriate pappus with pale yellow-brown setae and by lacking a receptacular palea. *Saussurea sugongii* is distinguished from *S. glacialis* by its broader leaves that are obovate, flabelliform, spatulate, or suborbicular, adaxially glabrous, abaxially densely white tomentose, and with a rounded and dentate leaf apex. *Saussurea sugongii* is distinguished from *S. gnaphalodes* by its purple, glabrous involucral bracts. *Saussurea glacialis* is characterized by narrower leaves that are linear-spatulate, adaxially pubescent, and abaxially glabrous, with a white pappus arranged in two rows. *Saussurea gnaphalodes* is characterized by leaves that are oblong or narrowly spatulate, with both blade surfaces pale gray or yellow-brown pubescent; the upper leaves and involucral bracts that are abaxially black pubescent; and the pappus that is black or rarely dark brown and arranged in two rows.

Paratypes. CHINA. **Xinjiang:** Ruoqiang, N side of Muztagae mtn. pass, in gravel zone on high mtns., 5400 m, 19 Aug. 1988, *S. G. Wu 2248* (KUN, MO), 4950 m, 19 Aug. 1988, *S. G. Wu 2249* (KUN, MO).

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A New Species of *Polygala* (Polygalaceae) from Southern Brazil

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Abstract. A new species is recognized here as part of the taxonomic revision of the Polygalaceae in southern Brazil. *Polygala densiracemosa* Lüdtke & Miotto belongs to *Polygala* L. subg. *Polygala*, which comprises around 88 species and 22 varieties in Brazil, being the best represented subgenus of *Polygala* in the Brazilian flora. *Polygala densiracemosa* can be confused with *P. campestris* Gardner and *P. linoides* Poir. by the resemblance of the flowers, fruits, and seeds and by the similar geographical distribution. However, *P. densiracemosa* is distinguished by a generally caespitose habit and dense racemes. The new species is described and illustrated, observations on habitat and distribution are provided, and differences among related taxa are discussed.

Resumo. Uma nova espécie é reconhecida aqui como parte da revisão taxonômica da família Polygalaceae na região sul do Brasil. *Polygala densiracemosa* Lüdtke & Miotto pertence ao *Polygala* L. subg. *Polygala* que compreende cerca de 88 espécies e 22 variedades, constituindo-se no subgênero de *Polygala* melhor representado na flora brasileira. *Polygala densiracemosa* pode ser confundida com *P. campestris* Gardner e *P. linoides* Poir. na semelhança das flores, frutos, sementes e na distribuição geográfica. Entretanto, *P. densiracemosa* apresenta hábito geralmente cespitoso e racemos muito densos. São fornecidos descrição, ilustração, observações sobre os hábitats e distribuição desta nova espécie, além disso, são discutidas as diferenças entre os táxons relacionados.

Key words: Brazil, IUCN Red List, *Polygala*, Polygalaceae, Rio Grande do Sul, subgenus *Polygala*.

The Polygalaceae are represented by 19 genera with approximately 1000 species widely distributed, especially in tropical regions, with an abundant distribution in Central and South America, Africa, and Asia (Paiva, 1998). In Brazil, the family encompasses seven genera: *Barnhartia* Gleason, *Bredemeyera* Willd., *Diclidanthera* Mart., *Monnina* Ruiz & Pav., *Moutabea* Aubl., *Polygala* L., and *Securidaca* L., totaling approximately 240 species (Marques, 1979).

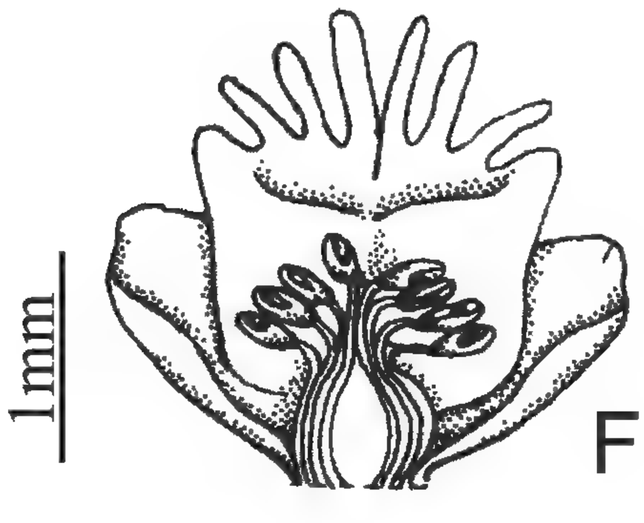
Polygala is the largest genus of the Polygalaceae, comprising about 725 species worldwide (Paiva, 1998). In the Brazilian flora, the genus *Polygala* is well represented by 110 species and 30 varieties (Marques & Peixoto, 2007) and can be distinguished from other Polygalaceae by the dehiscent, 2-seeded capsule.

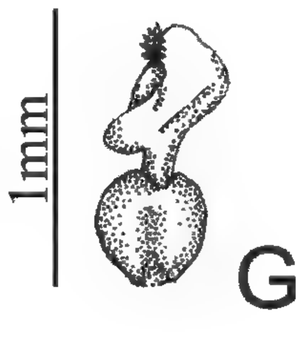
Previous taxonomic reviews of the Polygalaceae or the genus *Polygala* in Brazil include those of Wurdack and Smith (1971), Marques (1984a, b, 1988), Silva (2001), Lüdtke and Miotto (2004), Marques and Peixoto (2007), and Aguiar et al. (2008). During the current taxonomic revision of the family in southern Brazil (Paraná, Santa Catarina, and Rio Grande do Sul states), 40 species of *Polygala* were recognized, with one newly described here.

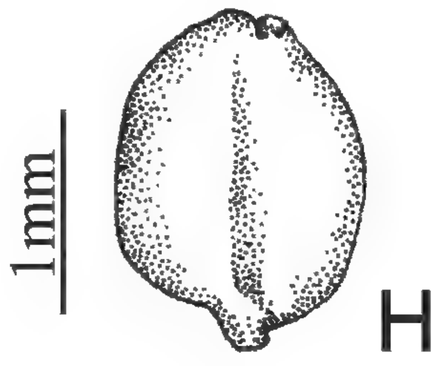
Polygala densiracemosa Lüdtke & Miotto, sp. nov. TYPE: Brazil. Rio Grande do Sul: Campestre da Serra, BR 116, Km 63, 3 Nov. 2003, *R. Lüdtke 193* (holotype, ICN). Figure 1.

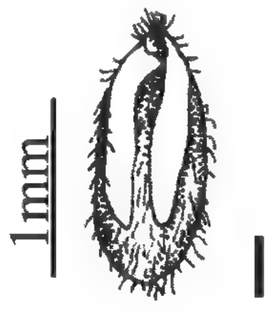
Haec species praecipue et racemis pedunculatis cylindricis valde prope ad *Polygalam campestrem* Gardner, sed ab ea habitu caespitoso, racemis densioribus, bracteis eciliatis, floribus albis minoribus (2–2.5 mm longis) et carinae crista 6-loba differt.

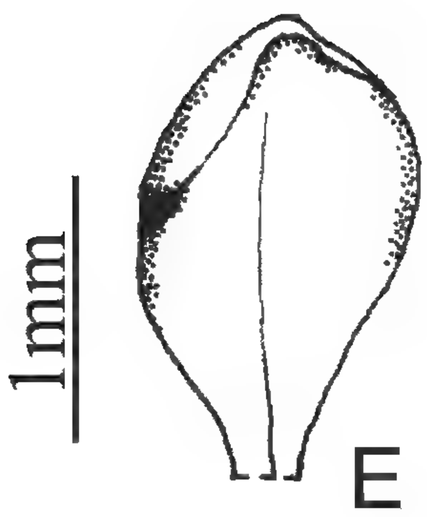
Herbs decumbent or caespitose, eglandular, 11–45 cm high; stems quadrandular, glabrate or poorly pilose, with short trichomes. Leaves abundant, sessile, alternate, papyraceous, glabrous or rarely pilose, ovate, elliptic, or oblong, 2–11 × 2–5 mm, apex mucronate, apiculate, or acuminate, base attenuate, margins entire and smooth; bracts deciduous, lanceolate, subulate, 1–1.8 mm, margins smooth; bracteoles deciduous, ovate, margins smooth. Racemes densely congested, pedunculate, terminal, cylindrical, 3–

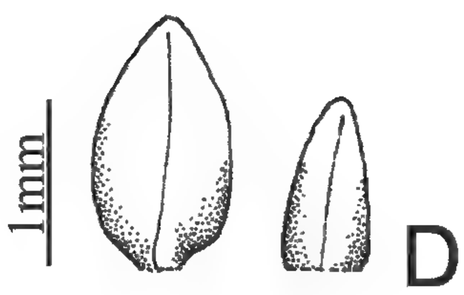


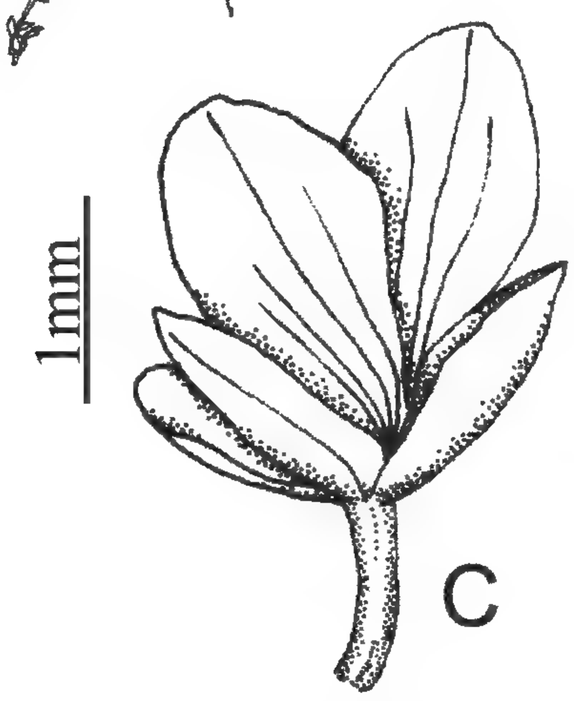












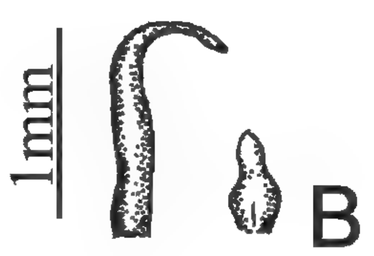


Figure 1. *Polygala densiracemosa* Lüdtke & Miotto. —A. Habit. —B. Bract and bracteole. —C. Calyx in lateral view. —D. External sepals. —E. Internal sepal. —F. Longitudinal sections of corolla and androecium. —G. Gynoecium in longitudinal view. —H. Capsule. —I. Seed. Drawn from the holotype, *R. Lüdtke 193* (ICN).

12 cm; pedicels to 1 mm, glabrous, reflexed or pendulous in fruit. Flowers 2–2.5 mm, white with purple or blue spots; external sepals unequal, inserted at the same point, glabrous, apex acute or obtuse, margins entire; 1 sepal widely ovate, 1.2–1.3 mm, 2 sepals elliptic or ovate, 1–1.2 mm; internal sepals glabrous, spatulate or elliptic, 2–2.6 mm, apex rounded, base attenuate; lateral petals glabrous, elliptic, 1.5–2 mm, apex rounded, keel crested, crest 0.8–1 mm, with 6 lobes simple or bifid; ovary

glabrous, suborbicular or widely elliptic in outline. Capsule glabrous, suborbicular or widely elliptic in outline, 1.1–2 mm, stipitate, not winged; seeds finely pubescent, elliptic in outline, 1.2–1.8 mm, with membranous appendage totally bilobed, ca. 1/5 to equal to the seed in length.

Distribution and habitat. *Polygala densiracemosa* has been collected in southern Brazil, in the states of Santa Catarina and Rio Grande do Sul, from fields and roadsides, in dry soils.

IUCN Red List category. *Polygala densiracemosa* is assessed as Near Threatened (NT) according to IUCN Red List criteria (2001) due to habitat degradation by human activities, such as fire settings for pasture renovation and silvicultural expansion over natural areas of southern Brazilian grasslands. Our fieldwork estimates a current total population of less than 500 mature individuals for the new species.

Phenology. Plants were observed with flowers and fruit occurring from October to December.

Etymology. The Latin epithet refers to the densely congested racemes, which are a diagnostic feature of this species.

Discussion. *Polygala densiracemosa* is included in subgenus *Polygala* L., which is recognized by the flowers with a crested keel. This subgenus is represented by approximately 88 species and 22 varieties in the Brazilian flora (Marques, 1988).

Polygala densiracemosa was initially identified in herbarium collections as *P. campestris* Gardner, due to their resemblance in habit and a similar geographical distribution, with both occurring in high fields in the states of Santa Catarina and Rio Grande do Sul. However, *P. densiracemosa* is generally caespitose and presents densely congested racemes, whereas *P. campestris* has a prostate habit and the racemes are lax. The two species also differ in the margin of the bracts, which is glabrous in *P. densiracemosa* and ciliate in *P. campestris*; the flowers, which are smaller (2–2.5 mm) and white in *P. densiracemosa* and blue or purple and larger (3–4.3 mm) in *P. campestris*; and the crest of the keel, which has six simple or bifid lobes in *P. densiracemosa* and eight to 12 lobes in *P. campestris*. Another species similar to *P. densiracemosa* is *P. linoides* Poir. These two species are similar in the length of the floral whorls, but in *P. linoides* the habit is erect and the leaves are scantily distributed, while in *P. densiracemosa* the leaves are more abundant. Although both species occur in high fields, *P. linoides* is found in wetlands and bogs, while *P. densiracemosa* occurs only in dry fields and roadsides and is also found at lower altitudes.

Paratypes. BRAZIL. **Rio Grande do Sul**: Almirante Tamandaré do Sul, BR 386, Km 160, 28°10′34.3″S, 52°50′10.9″W, 9 Oct. 2006, *R. Lüdtke 581* (ICN); Caçapava do Sul, 24 Nov. 1982, *J. Matos & Rubem F. 24688* (HAS); Campestre da Serra, BR 116, Km 70, 3 Nov. 2003, *R. Lüdtke 193* (ICN); Campestre da Serra, BR 116, Km 76, 28°46′13.2″S, 51°05′32.2″W, 5 Nov. 2007, *R. Lüdtke 768* (ICN); Carazinho, Granja Pinheirinho, 2 Oct. 1971, *J. C. Lindeman et al. s.n.* (ICN 8214); Caseiros, BR 285, Km 232, 4 Nov. 2003, *R. Lüdtke 199* (ICN); Cruz Alta, S de Cruz Alta, 2 Oct. 1971, *J. C. Lindeman et al. s.n.* (ICN 8239); Cruz Alta, BR 377, Km 94, 28°37′40.6″S, 53°27′41.7″W, 3 Oct. 2007, *R. Trevisan 838* (ICN, MO); Esmeralda, 1 Oct. 1984, *L. R. M. Baptista et al. s.n.* (ICN 62681); Esmeralda, 27 Dec. 2002, *R. Lüdtke 108* (ICN); Esmeralda, Estação Ecológica Aracuri, 7 Nov. 1982, *S. T. S. Miotto & E. Franco s.n.* (ICN 64908); Esmeralda, 12 Dec. 1982, *S. T. S. Miotto s.n.* (ICN 648751); Esmeralda, 8 Sep. 1983, *S. M. Eisinger s.n.* (ICN 94751); Fontoura Xavier, BR 386, 28°53′18.1″S, 52°25′05.3″W, 2 Oct. 2007, *R. Trevisan 837* (ICN, MO); Jaquirana, 3 Nov. 2002, *R. Lüdtke 34* (ICN), *R. Lüdtke 40* (ICN); Jaquirana, 25 Nov. 2004, *R. Lüdtke 302* (ICN); Jaquirana, a 36 km de Bom Jesus, 16 Oct. 2004, *S. T. S. Miotto 2205* (ICN); Júlio de Castilhos, BR 158, 29°15′04.3″S, 53°39′54.1″W, 3 Oct. 2007, *R. Trevisan 847* (ICN); São Francisco de Paula, 20 km ENE, 13 Nov. 1972, *J. C. Lindeman et al. s.n.* (ICN 20874); São Francisco de Paula, RS 020, 29°24.744′S, 50°28.289′W, 25 Nov. 2004, *R. Lüdtke 288* (ICN); Vacaria, Ipê, 2 Nov. 1987, *P. Backs s.n.* (ICN 80386); Vacaria, BR 116, 28 Dec. 2002, *R. Lüdtke 119* (ICN). **Santa Catarina**: Bom Jardim da Serra, a 5 km E da cidade, 25 Nov. 1980, *A. Krapovickas y R. Vanni 36916* (CTES); Bom Jardim da Serra, SC 438, 19 Oct. 2004, *R. Lüdtke 244* (ICN); Bom Jardim da Serra, beira da SC 438, 19 Oct. 2004, *R. Lüdtke 247* (ICN); Painel, Km 35 da rodovia Lages–São Joaquim, 20 Oct. 2004, *R. Lüdtke 264* (ICN); Painel, SC 438, Km 15, 27°52′23.2″S, 50°10′44.6″W, 6 Nov. 2007, *R. Lüdtke 781* (ICN); São Joaquim, Km 52 da rodovia Lages–São Joaquim, entrada da Fazenda Bela Vista, 20 Oct. 2004, *R. Lüdtke 266* (ICN).

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A New Species of *Casearia* (Salicaceae) from Southeastern Brazil

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Abstract. *Casearia espiritosantensis* R. Marquete & Mansano, a new species of Salicaceae from Espírito Santo, Brazil, is described and illustrated here. This species is similar to the widespread *C. decandra* Jacq. in having fasciculate inflorescences, lanceolate or elliptic-lanceolate leaves, and 10 stamens. The new species differs by being a shrub and having smaller stipules, anthers with apical glands, hirsute ovaries, and clavate stigmas. Other diagnostic aspects of *C. espiritosantensis* are the sparsely serrate leaf margins and the stipules with glands at the base of the adaxial surface.

Resumo. *Casearia espiritosantensis* R. Marquete & Mansano, uma espécie nova de Salicaceae do Espírito Santo, Brasil, é descrita e ilustrada no presente trabalho. Esta espécie é semelhante a *C. decandra* Jacq., uma espécie amplamente distribuída, pela inflorescência fasciculada, folhas lanceoladas ou elíptico-lanceoladas e 10 estames. Difere pelo hábito arbustivo, pelas estípulas menores, pelas anteras com glândulas apicais, pelo ovário hirsuto e estigma clavado. Outros caracteres diagnósticos desta nova espécie são: margem das folhas esparsamente serreadas e estípulas com glândulas na base da face adaxial.

Key words: Atlantic rainforest, Brazil, *Casearia*, Espírito Santo, Flacourtiaceae, Salicaceae.

Casearia Jacq. (Salicaceae, formerly Flacourtiaceae) is a pantropical genus distributed in Africa and Central and South America with ca. 180 species. It occurs in varied habitats, including the Atlantic rainforest, savanna, and seasonal semideciduous forest, and is most diverse in Central and South America where 75 species have been found (Sleumer, 1980; Castillo-Campos & Abreo, 2003). According to Sleumer (1980) in his treatment for the *Flora Neotropica*, 45 species occur in Brazil. In his treatment, Sleumer (1980) described 15 new species from Brazil and made some synonymizations; he based his classification of species on the work of Eichler (1871). Since then, increased field activity in Brazil has revealed new taxa that need to be described. The new species described here can be recognized in particular by its sparsely serrate leaf margins and the stipules with glands evident at the base of the adaxial surface.

Casearia espiritosantensis R. Marquete & Mansano, sp. nov. TYPE: Brazil. Espírito Santo: Santa Teresa, Reserva Biol. Augusto Ruschi, estrada principal, próximo a sede, 2 Sep. 2003 (fl.), *J. Rossini, E. Bausen & W. Pizziolo 527* (holotype, RB; isotype, MBML). Figure 1.

Species qua inflorescentiis fasciculatis, foliis lanceolatis vel elliptico-lanceolatis, sepalis quinque et staminibus decem ad *Caseariam decandram* Jacq. proxime accedit, sed ab ea habitu fruticoso, stipulis minoribus, antheris ad apicem glandulosis et stigmatibus clavatis differt.

Shrub, ca. 3 m tall; trunk with bark smooth, grayish brown; branches tomentose, basally glabrescent and apically densely tomentose, brown. Stipules 2.5–3 × ca. 0.25 mm, subulate, persistent, with claviform glands on the adaxial surface; leaves alternate, simple, with the petiole 2–3 m, terete, hirsute, slender; blades 3–5.2 × 1.6–2.2 cm, chartaceous, lanceolate or elliptic-lanceolate, abaxial surface sparsely villose, with the nerves villose, adaxial surface sparsely villose only on the primary vein, apex long-acuminate to acuminate, base acute, margin sparsely serrate, marginal teeth ca. 0.4 mm, more frequent in the upper half of the leaf blade, pellucid punctations minute and lateral veins in 4 ascending pairs, the other veins forming a dense reticulation, prominent on the abaxial surface. Inflorescences in fascicles, each fasciculate unit 4(to 9)-flowered; bracts ca. 1 mm, at the pedicel base, coriaceous,

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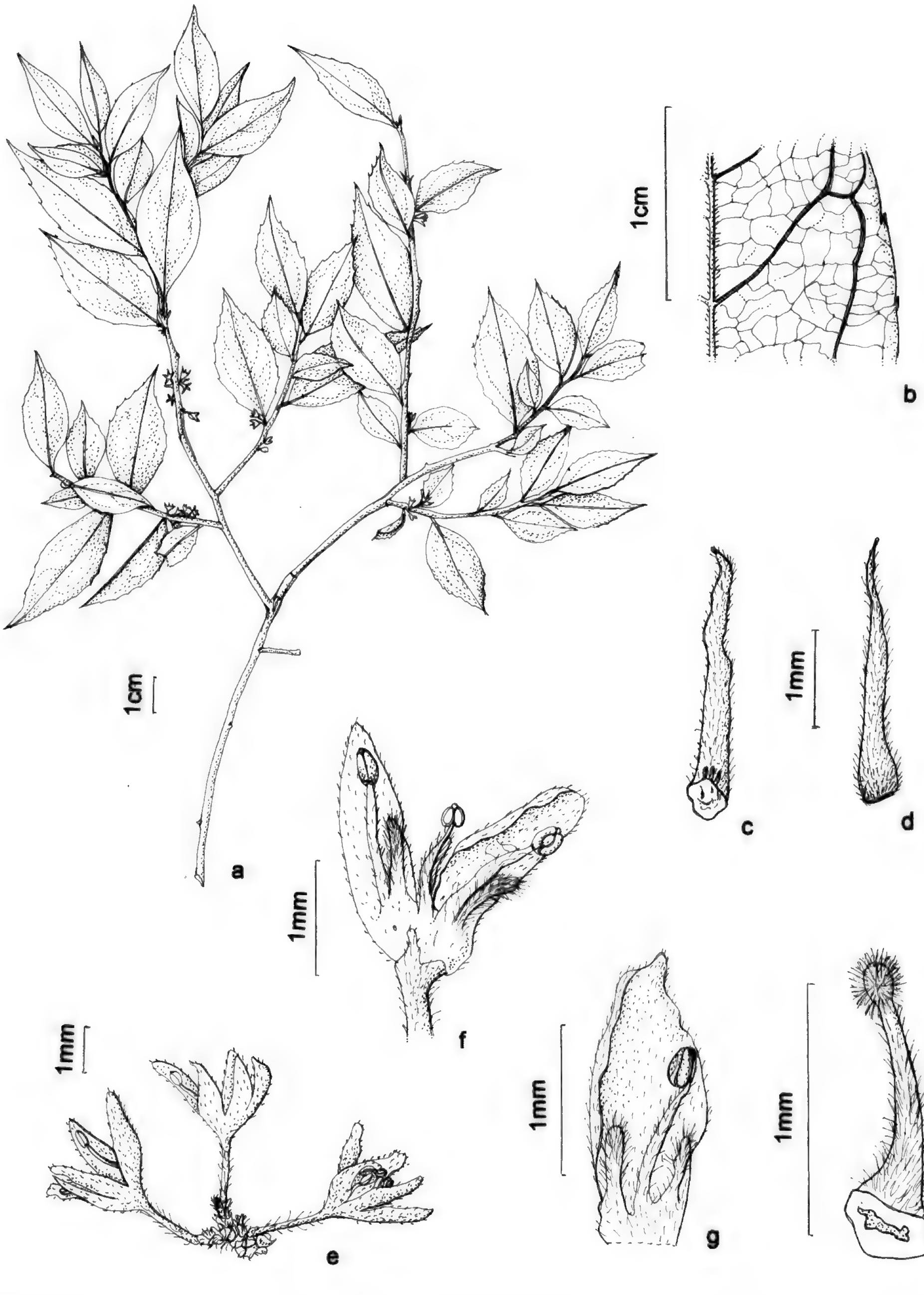

Figure 1. *Casearia espiritosantensis* R. Marquete & Mansano. —A. Fertile habit. —B. Detail of the abaxial leaf surface showing the margin. —C, D. Stipules, showing adaxial and abaxial surfaces, respectively. —E. Inflorescence. —F. Partial flower showing the gland at the apex of the anthers. —G. Disk lobes connate at the base of the sepals and alternate with the stamen. —H. Pubescent gynoecium and stigma with hirsute trichomes. Drawn from the holotype, *Rossini et al. 527* (RB).

ovate to cucullate; pedicels ca. 3 mm, terete, basally articulate, white, hirsute. Floral buds oblong-lanceolate, sparsely tomentose; flowers bisexual; sepals 5, ca. 3.5 × 1.2 mm, fused basally, ovate, greenish white, tomentose, white externally, glabrescent at the base and tomentose internally; stamens 10, filaments yellow, 1(–1.5) mm, sparsely pilose, free, anthers yellow, oblong, with a minute gland at the apex, glabrous; disk lobes yellow, ca. 1 mm, oblong, connate at the base of the sepals and alternate with filaments, pilose; ovary yellow, ovate to lanceolate-ovate, with trichomes sparse, hirsute, white, the style slender,

Table 1. Distinguishing characters between *Casearia espiritosantensis* R. Marquete & Mansano and its most morphologically similar species, *C. decandra* Jacq.

	C. espiritosantensis	*C. decandra*
Habit	shrub, ca. 3 m high	tree, 8–18 m high
Stipules	2.5–3 × ca. 0.25 mm, glands at the base of the adaxial surface	ca. 7 × 0.5 mm, glands at the margins
Petiole	hirsute	puberulent
Leaf blade	3–5.2 × 1.6–2.2 cm	5–7(–9) × 2–4.1 cm
Leaf shape	lanceolate or elliptic-lanceolate	lanceolate to oblong-lanceolate
Leaf abaxial surface	sparsely villose	rarely pubescent to glabrescent on the veins
Leaf base	acute	cuneate to slightly asymmetrical
Leaf margin	sparsely serrate	serrate to crenate
Pedicel	hirsute	tomentose
Flower buds	oblong-lanceolate	obovate-oblong to oblong-ovate
Sepals	ovate	oblong-lanceolate
Stamen filaments	sparsely pilose at the base	tomentose at the base
Anthers	oblong, minute gland at apex	globose, without gland at apex
Disk lobes	oblong	oblong-clavate
Ovary	ovate to lanceolate-ovate, sparsely hirsute	ovate to oblong-ovate, villose
Stigmas	clavate	capitate

entire, glabrous, the stigma white, clavate, entire, hirsute.

Distribution and habitat. *Casearia espiritosantensis* occurs in the Atlantic rainforest in Brazil, at altitudes from 600 to 700 m.

IUCN Red List category. Although the new species was found in a protected area, it should be considered Critically Endangered (CR) according to IUCN Red List criteria (2001) because of its narrow geographical distribution and the small number of herbarium specimens that have been located.

Etymology. The specific epithet *espiritosantensis* refers to the state of Espírito Santo, Brazil, where the species is endemic.

Relationships. *Casearia espiritosantensis* is similar to *C. decandra* Jacq. by its fasciculate inflorescences, leaf shape, and number of sepals. It differs from *C. decandra* by being a shrub (vs. tree) and having smaller stipules that have glands at the anther apex (lacking in *C. decandra*), a hirsute ovary (vs. villose in *C. decandra*), and clavate stigmas (vs. capitate in *C. decandra*). Further morphological comparison of these two species can be found in Table 1. The new species is endemic to the state of Espírito Santo, Brazil, while *C. decandra* has a wide distribution in the Neotropics. In Brazil, *C. decandra* occurs from north to south in different habitats (Marquete, 2001).

Paratype. BRAZIL. **Espírito Santo**: Castelo, Parque Estadual do Forno Grande, *L. Kollman & R. L. Kollman 8937* (MBML, RB).

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A New Variety of *Rungia linifolia* (Acanthaceae) from the Western Ghats of Karnataka, India

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ABSTRACT. *Rungia linifolia* Nees var. *saldanhae* Mascar. & Janarth. (Acanthaceae), a new variety from Kottigehara in Charmadi Ghat, Karnataka State (Western Ghats), is described and illustrated. The new variety is very similar to the typical variety *R. linifolia* var. *linifolia* in its filiform branches, inwardly curved inflorescence axis, secund, four-ranked spikes with two flowerless bracts and two flowered bracts, lanceolate bracteoles with scarious margins, and superposed anther lobes with the lower one spurred. The new variety differs in its larger size, pubescent stems, ciliate leaf margin, elliptic-lanceolate bracts, and the compound, verrucose testa of the seed.

Key words: Acanthaceae, India, IUCN Red List, *Rungia*, Western Ghats.

The genus *Rungia* Nees (Acanthaceae) is represented by about 50 species in the tropics (Mabberley, 1997). In India it is represented by 13 species (Santapau & Henry, 1973), of which four species are endemic to the Western Ghats. *Rungia linifolia* Nees is endemic to the northern and central Western Ghats and is considered rare and threatened (Ahmedullah & Nayar, 1986). During the floristic study of endemic Acanthaceae from the northern and central Western Ghats, an interesting specimen of *R. linifolia* was collected from Kottigehara in Charmadi Ghat, Karnataka State. Critical examination of the collected specimen in comparison with specimens in various herbaria shows that *R. linifolia* consists of two distinct entities. Hence, the collection described here represents a new variety of *R. linifolia*.

1. Rungia linifolia Nees, Pl. Asiat. Rar. (Wallich), vol. 3: 110. 1832. TYPE: India. s. loc., s.d., *B. Heyne 2447* (holotype, CAL).

Small herb; stem slender, erect, 4–18 cm, obtusely quadrangular, scabrous, filiform. Leaves with the petioles 1–2 mm; lamina elliptic-lanceolate, 4–20 × 1–8 mm, apex acute, margins sparsely ciliate, coriaceous, glabrous or minutely scabrid; secondary veins in 2 to 4 pairs. Inflorescences as spikes, 0.5–5 cm, filiform, curved inward; bracts ovate-elliptic, ca. 3.5 mm, apex mucronate-cuspidate, margins scarious, ciliate, glandular-pubescent externally, sparsely glandular-pubescent internally; floral bract with apex short, mucronate-cuspidate; bracteoles 2 per flower, lanceolate, ca. 3.5 mm, apex acuminate, margins narrowly scarious, ciliate. Flowers with the corolla 5–7 mm, pale purplish white with transverse purple stripes on lower lip; ovary oblong-elliptic, sparsely pubescent. Capsule elliptic-obovate, 2–3 × ca. 1 mm, tetragonous; seeds 4 per capsule, orbicular-oblong, ca. 1 × 1 mm, light brown, seed testa verrucose.

Specimens examined. INDIA. **Karnataka:** Uttara Kannada Distr., Vincholi riverbanks, *W. A. Talbot 937* (BSI); Gersoppa Falls, *Hall & McCann 34142* (BLAT); Jog Falls, *H. Santapau 18531* (BLAT), *G. S. Puri 2070* (BSI); Gund Range, Dandeli, *K. R. Keshavamurthy & S. B. Mohanan* KFP*6043* (JCB), KFP*6048* (JCB); Dandeli–Gund Rd., *K. P. Sreenath & S. R. Ramesh* KFP*10831* (JCB); betw. Ulvi & Dandeli near Kaner, *M. E. Mascarenhas & M. K. Janarthanam 381* (Goa Univ. Herb.).

1a. Rungia linifolia var. **linifolia.**

1b. Rungia linifolia var. **saldanhae** Mascar. & Janarth., var. nov. TYPE: India. Karnataka: Chikmagalur Distr., Kottigehara, 21 Feb. 2006, *M. E. Mascarenhas & M. K. Janarthanam 205* (holotype, CAL; isotypes, BSI, MO). Figure 1.

Haec varietas a varietate typica statura majore, caulibus pubescentibus, foliis margine ciliatis, bracteis ellipticolanceolatis apice acuminato et testa composita differt.

Herb; stems slender, erect, to 30 cm, quadrangular, pubescent, branches dichotomous, filiform. Leaves opposite; petioles 5–7 mm, obscure due to decurrent leaf bases; lamina elliptic to linear-lanceolate, 2.5–4.5 × 0.5–1 cm, tapering at both ends, apex acuminate, margin entire, slightly revolute, ciliate, membranous, pubescent, more so on nerves on abaxial surface, cystoliths on abaxial surface; principal veins prominent, raised on both sides, with secondary veins in 3 to 5 pairs. Inflorescences as axillary or terminal spikes, 1.5–2.5 cm, secund, 4-ranked; peduncles to 4.5 cm, filiform, curved inward, glandular-pubescent; bracts at the base of inflorescence axis reduced, similar to

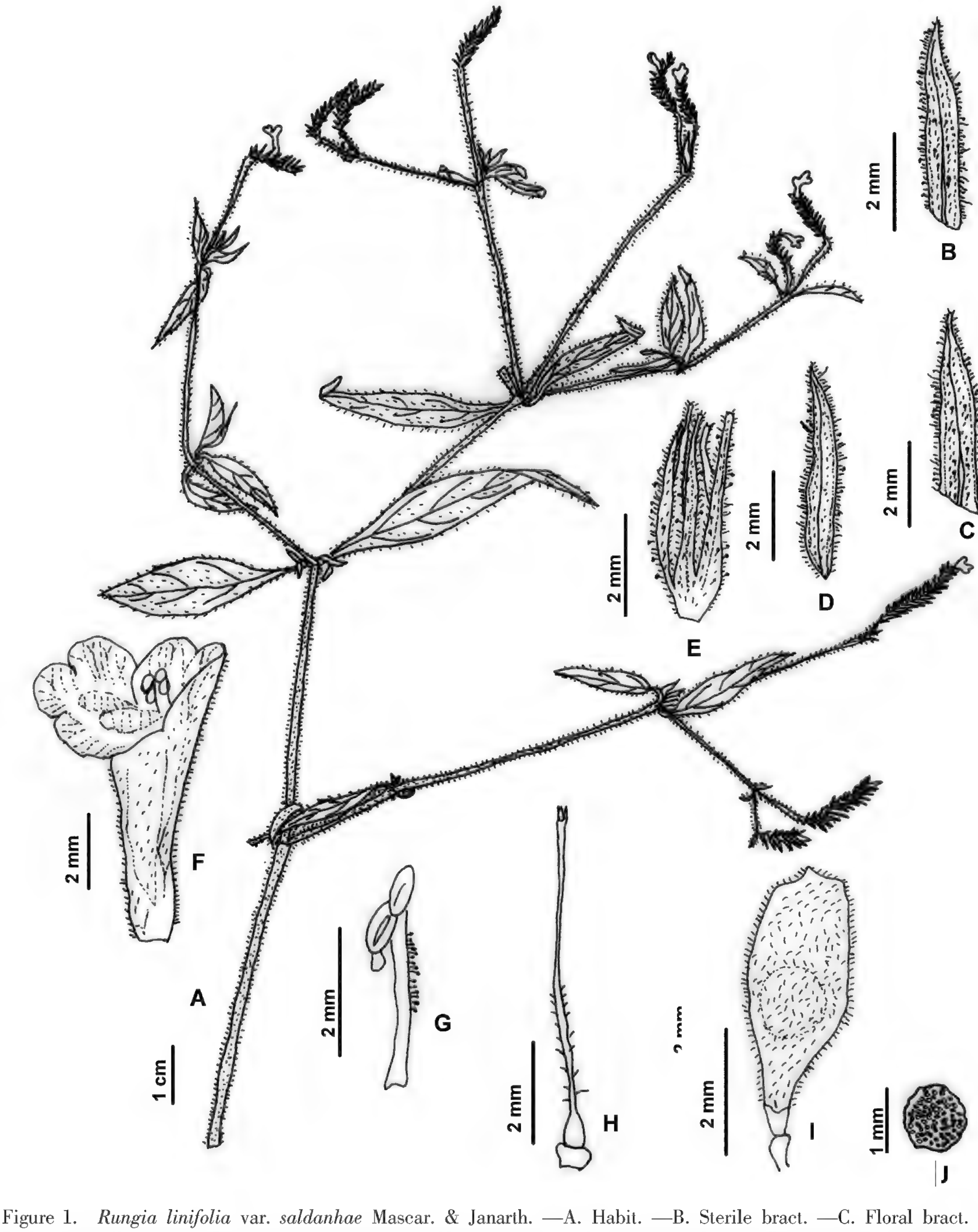

Figure 1. *Rungia linifolia* var. *saldanhae* Mascar. & Janarth. —A. Habit. —B. Sterile bract. —C. Floral bract. —D. Bracteole. —E. Calyx. —F. Corolla. —G. Stamen. —H. Gynoecium. —I. Capsule. —J. Seed. Drawn from the holotype *M. E. Mascarenhas & M. K. Janarthanam 205* (CAL).

leaves; bracts elliptic-lanceolate, ca. 5 mm, apex acuminate, margin entire, scarious, ciliate, glandular-pubescent externally, sparsely glandular-pubescent internally, bract midrib prominent, the floral and sterile bracts similar; bracteoles 2 per flower, lanceolate, ca. 3 mm, apex acuminate, margin scarious, ciliate, glandular-pubescent externally, glabrous or nearly so internally, bracteole midrib prominent, pubescent. Flowers with the calyx ca. 3.5 mm, divided almost to the base, segments unequal, linear-lanceolate, glandular-pubescent externally; corolla ca. 9 mm, pinkish white with pink stripes on lower lip, distinctly 2-lipped, pubescent externally, sparsely hairy internally; tube ca. 4 mm, cylindric; upper portion ca. 5 mm, ventricose, distinctly bi-lipped; upper lip 2-lobed, lower lip 3-lobed, lobes obtuse, the middle one larger;

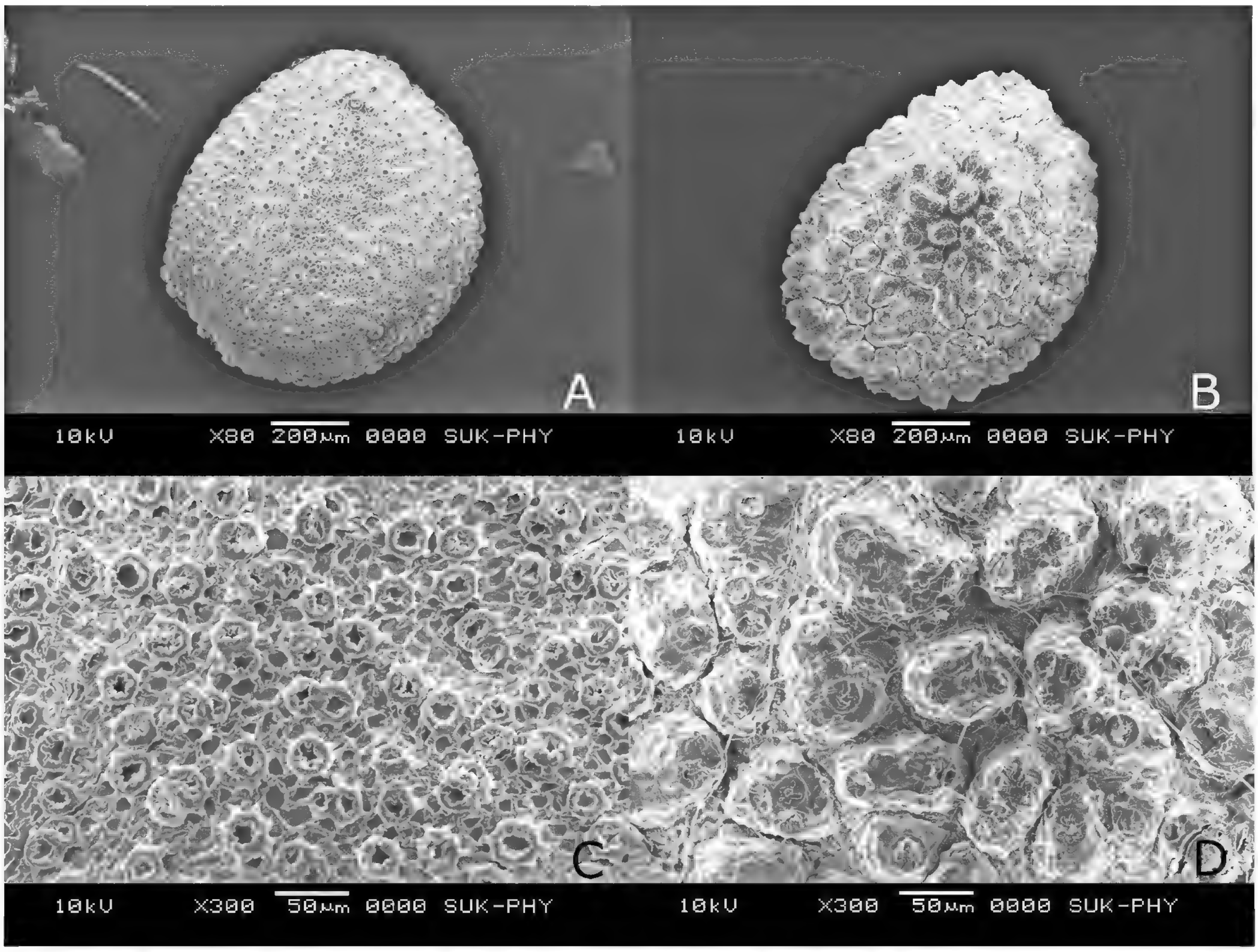

Figure 2. SEM images of *Rungia linifolia* seeds. A, C. *Rungia linifolia* var. *linifolia* (*M. E. Mascarenhas & M. K. Janarthanam 381*, Goa Univ. Herb.). B, D. *Rungia linifolia* var. *saldanhae* (*M. E. Mascarenhas & M. K. Janarthanam 205*, CAL). —A, B. Entire seeds. —C, D. Magnified view.

stamens 2; filaments flattened, ca. 2.5 mm, glandular on outer margins at distal half; anthers bithecous; anther lobes ca. 0.75 mm, oblong, superposed, with a spur at the base of the lower anther lobe; disc cupular; ovary ovoid; ovules 4; style sparsely pubescent at base; stigma bifid. Capsule obovate, 3.5–4.5 mm, stipitate, apex mucronulate, pubescent all over; seeds 4 per capsule, orbicular-oblong, ca. 1 × 1 mm, brown, seed testa compound verrucose.

Note. Morphological measurements were based on material preserved in formalin–acetic acid–alcohol (FAA) as well as from herbarium collections.

Distribution and habitat. Rungia linifolia var. *saldanhae* has been collected from Chikmagalur and Hassan districts in Karnataka State. The new variety was found growing in a small patch along the roadside in shaded and moist conditions between the communities of Kottigehara and Jenukallu, a locality in the upper portion of the Western Ghats. Earlier collections of *R. linifolia* var. *saldanhae* considered as paratypes here were reported to be undergrowth along forest paths and streams of moist deciduous forests. In contrast, the typical variety occurs in dried riverbeds among rock crevices and in exposed conditions.

IUCN Red List category. The conservation status of *Rungia linifolia* var. *saldanhae* is assessed as Endangered (EN B2ab[iii,iv]) according to IUCN Red List criteria (2001) because its area of occupancy is estimated to be less than 500 square kilometers and it is known to exist at no more than five localities. The authors were unable to locate any populations in previously reported localities for the paratypes, thus indicating the taxon's decline in distributional area and number of locations. The present type locality is projected as very fragile, as any road-widening activity will threaten its habitat and further endanger its existence.

Etymology. The epithet of the new variety honors the late Fr. Cecil J. Saldanha, S.J., who has contributed immensely to the taxonomy of this region.

Discussion. The new variety differs from the typical variety of *Rungia linifolia* by its larger size (to 30 cm high vs. 4–18 cm in var. *linifolia*); pubescent stems (vs. scabrous); leaves that are longer (25–45 × 5–10 mm vs. 4–20 × 1–8 mm), membranous (vs. coriaceous), with ciliate margins and an acuminate apex (vs. only sparsely ciliate margins and an acute apex); bracts that are elliptic-lanceolate (vs. ovate-elliptic), with an acuminate apex (vs. mucronate-cuspidate); and the compound verrucose seed testa (vs. simple) (Fig. 2). Because the differences in plant size, stem pubescence, and leaf morphology could be attributed to differences between their habitats, the new taxon is described here as a variety rather than as a species or subspecies.

Collections of *Rungia linifolia* were seen only from the district of Uttara Kannada in Karnataka State. The new variety has been documented from the districts of Chikmagalur and Hassan. Further investigation in the field is needed to see whether the two varieties are allopatrically distributed, with no distributional overlap.

Paratypes. INDIA. **Karnataka:** Chikmagalur Distr., Ballalarayanadurga, 27 Feb. 1963, *R. S. Raghavan 86993* (BSI); Hassan Distr., Devalkere, 24 Jan. 1969, *C. J. Saldanha 12436* (JCB); stream betw. Devalkere & Devarunde, 24 Feb. 1970, *C. J. Saldanha 16461* (JCB); stream before Devarunde, 28 Jan. 1971, *T. P. Ramamoorthy* HFP *1369* (JCB).

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Jaltomata bohsiana: A New Species and Key to the *Jaltomata* (Solanaceae) of Mexico

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Abstract. A new species of *Jaltomata* Schltdl. (Solanaceae) from Mexico is described and a key to the *Jaltomata* of Mexico is provided. Known only from the type locality, *J. bohsiana* Mione & D. M. Spooner is distinguished from the similar *J. procumbens* (Cav.) J. L. Gentry by having a purple flowering calyx to 6.8 mm diam., the calyx lobes both recurved and concave in cross section, and a fruiting calyx to 10 mm diam. In contrast, *J. procumbens* has a mostly green flowering calyx that is not recurved, the calyx lobes are not concave in cross section, with a diameter greater than 7 mm, and a fruiting calyx diameter greater than 10 mm.

Key words: IUCN Red List, *Jaltomata*, Mexico, Solanaceae, trichomes.

In Mexico, the berries (1–1.9 cm diam.) of *Jaltomata* Schltdl. species (Solanaceae) are commonly consumed and sold in markets (Davis & Bye, 1982; Williams, 1985; Davis, 1986). The leaves are consumed like spinach (Nee, 1986), and plants are used as fodder (Casas et al., 2001). The labels of a few herbarium specimens list medicinal uses of various parts. Despite widespread use, the taxonomy of this group has not been adequately studied. *Flora Fanerogámica del Valle de México* (Rzedowski & Rzedowski, 1985) and the *Flora de Veracruz* (Nee, 1986) list a single taxon, *J. procumbens* (Cav.) J. L. Gentry. Subsequent studies have led to the recognition of four species in Mexico: *J. chihuahuensis* (Bitter) Mione & Bye of northern Mexico; *J. grandiflora* (B. L. Rob. & Greenm.) D'Arcy, Mione & Davis of Michoacán (hills near Pátzcuaro); *J. procumbens*, a widespread and variable species distributed from Arizona, United States, to Ecuador; and *J. repandidentata* (Dunal) Hunz., distributed from Mexico to Bolivia. A fifth Mexican species is recognized here, based on morphological characters and DNA analysis, as part of ongoing taxonomic study of the genus *Jaltomata*.

Jaltomata bohsiana Mione & D. M. Spooner, sp. nov. TYPE: Mexico. México: on S side of rd. from Rte. 130 (134) to Valle de Bravo, 2 km E of San Ramón, 19°10′N, 100°01′W, 2450 m, pine forest with epiphytic vegetation, growing in soil next to drainage ditch, rare, 15 Oct. 1988, *D. M. Spooner & J. Gómez 4253* (holotype, CONN; isotype, MEXU). Figure 1.

Haec species *Jaltomatae procumbenti* (Cav.) J. L. Gentry similis, sed ab ea calyce sub anthesi purpureo usque ad 6.8 mm diam. lobis in sectione tranversali recurvis concavis, sub fructu usque ad 10 mm diam. distinguitur.

Erect herb becoming woody only at base, 60–90 cm tall; stems purple proximally, green distally (Fig. 1A) except for purple nodes, the mature stems glabrate but pubescent at nodes; stem of seedling densely pubescent. Leaves alternate, often geminate, the blade membranous, elliptical, to 16 × 7.9 cm, glabrate, margin entire to slightly repand, apex acuminate, base aequilateral and attenuate; petiole to 3.3 cm. Inflorescence axillary, umbellate (Fig. 1), 5- to 7-flowered including buds; peduncles to 25 mm (to 31 mm with ripe fruit), angled, green; pedicels 8–20 mm, angled, green to purple. Flowers with the calyx purple (Fig. 1B, C), darker at tips of the lobes on adaxial face, 5–6.8 mm diam., 2.5–3.25 mm from pedicel to lobe tip (4–5.5 mm with ripe fruit), ca. 1 mm from pedicel to sinus (ca. 2 mm with ripe fruit), the calyx lobes both recurved and concave in cross section (Fig. 1B). Corolla rotate, pale green, 5-lobed (Fig. 1A, B), adaxially pilosulose, 16–19 mm diam. in pistillate phase, 20–24 mm diam. in hermaphroditic phase, measured on living plants, 11–14 mm long (on holotype, pressed with flower oriented sideways), the margin ciliolate; stamens ca. 3 mm (pistillate phase, Fig. 1A upper flower) to 7 mm (hermaphroditic phase, Fig. 1A lower flower), slender part of the filament glabrous, villous on the expanded base, the trichomes to 0.5 mm, unbranched; undehisced anthers yellow

Figure 1. *Jaltomata bohsiana* Mione & D. M. Spooner. —A. Inflorescence, upper flower in earlier pistillate phase with short stamens and undehisced anthers, lower flower in later hermaphroditic phase with elongated stamens and dehisced anthers; the arrow points to the stigma. —B. Abaxial view of flower showing small purple calyx having sepals both recurved and concave in cross section. —C. Ripe fruit with calyx on top attached by peduncle and pedicel. Photos (by T.M.) are of cultivated plants grown from seeds of holotype. Scale bars = 5 mm.

except for green connective between pollen sacs in dorsal view, 1.43–1.65 mm (dehisced, pressed), 1.7–2 mm (undehisced, fresh); pollen grains 83,000 to 116,000 per androecium, 27.5–32.5 μm diam.; style straight, 4.2–6 mm; stigma capitate (Fig. 1A), light green, ca. 0.5 mm across, a very shallow medial groove evident at 32×; gynoecium glabrous except for stigma papillae to 0.02 mm; ovules 112 to 123 per ovary; disk (presumably the source of unpigmented nectar) girdling the base of the ovary. Mature berries shiny black, subspherical (Fig. 1C), ca. 6 × 8–9 × 11 mm when fresh, 8–10 mm across if pressed; seeds brown, numerous, 1.23–1.36 × 0.9–1.06 × 0.32–0.44 mm, ovate to subtriangular, alveolate.

Three types of trichomes were observed, all unpigmented: (1) trichomes of the young leaves, axes, and corolla margin are uniseriate, multicellular, almost always unbranched, gradually taper to a point, appear to lack nuclei, and vary in length; (2) trichomes of the adaxial face of the corolla are living, ca. 0.3 mm long, only the distal cells contain dense cytoplasm, and the distal end of the terminal cell is rounded, not pointed; (3) trichomes of the abaxial face of the corolla are 0.075 mm long, living, and have a multicellular head borne on a unicellular stalk (as illustrated in Mione & Serazo, 1999). The multicellular head stains densely with neutral red, but the stalk cell does not absorb this stain.

Distribution, ecology, and IUCN Red List category. *Jaltomata bohsiana* is known only from the type locality, a pine forest with epiphytic vegetation. Seeds germinated at room temperature in Connecticut without chemical or mechanical treatment. The IUCN Red List category (IUCN, 2001) is uncertain and is assessed here as Data Deficient (DD).

Etymology. The species epithet honors Lynn Allison Bohs, noted solanologist.

Discussion. *Jaltomata bohsiana* is similar to the widespread and variable species *J. procumbens*. The former is distinguished by having a smaller purple flowering calyx to 6.8 mm diam., calyx lobes both recurved and concave in cross section (Fig. 1B, C), and a fruiting calyx to 10 mm diam. In contrast, *J. procumbens* has a green (sometimes with purple lobe tips) flowering calyx that is not recurved, lobes that are not concave in cross section, with a diameter larger than 7 mm, and a fruiting calyx diameter greater than 10 mm. The seeds and pollen of *J. bohsiana* are noticeably smaller than those of most, but not all, collections of *J. procumbens*. Attempts to hybridize *J. bohsiana* with other similar *Jaltomata* species produced either no fruit-set, hybrid seeds that did not germinate, or hybrids with low pollen stainability (Mione, 1992). The DNA sequence for the gene *waxy* (GBSSI) shows in *J. bohsiana* a unique 27 base insertion, a duplication of the 27 bases immediately upstream of the duplication (Miller et al., in press). The type collection of *J. bohsiana* grouped with the other *Jaltomata* of the Mesoamerican clade in the plastid DNA phylogeny by Mione et al. (1994).

Although *Jaltomata* specimens have been borrowed from numerous herbaria, other specimens of this species have not been seen.

Paratypes. U.S.A. Specimens made from cultivated plants grown at the University of Connecticut and CCSU greenhouses and outdoor gardens, from seed of the type *Spooner & Gómez 4253*, *Mione 365* (CONN, MO).

KEY TO THE *JALTOMATA* SPECIES OF MEXICO

1a. Anthers unequal in size, most noticeable during the pistillate phase while anthers are undehisced; filaments sigmoid or curved during hermaphroditic phase; style curved; strongly but not exclusively associated with coffee plantations. . . . . *J. repandidentata*
1b. Anthers equal in size; filaments straight during hermaphroditic phase; style straight; habitat variable, including agricultural fields and other disturbed areas.
  2a. Calyx lobes concave in cross section; calyx purple at time of flowering, < 6.8 mm diam. . . . . *J. bohsiana*
  2b. Calyx lobes not concave in cross section; calyx mostly green at time of flowering, > 7 mm diam.
    3a. Anthers longer than 2.8 mm; leaves and branches densely velutinous; pollen > 42 μm diam. . . . *J. grandiflora*
    3b. Anthers shorter than 2.8 mm; leaves and branches glabrate to pubescent or hirsute; pollen diam. < 39 μm.
      4a. Vestiture of stems and leaves variable (including glabrate) but never hirsute; filaments angling away from style at 45° during hermaphroditic phase; corolla 5-lobed or with alternating lobes and lobules totaling 10; flowers per inflorescence variable; peduncle length variable; Arizona, United States, to Ecuador . . . . . *J. procumbens*
      4b. Stems and leaves hirsute; filaments angling away from style at no more than 15° during hermaphroditic state; corolla 5-lobed; inflorescence up to 4-flowered; peduncles not longer than 15 mm; northern Mexico . . . . . *J. chihuahuensis*

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Two New Species of *Cryptocarya* (Lauraceae) from Panama and Ecuador

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Abstract. Two new species of *Cryptocarya* R. Br., *C. panamensis* P. L. R. Moraes & van der Werff, from Colón, Panama, and *C. yasuniensis* P. L. R. Moraes & van der Werff, from Napo, Ecuador, are described and illustrated. Additionally, the occurrence of *C. guianensis* Meisn. in Ecuador is here reported for the first time.

Key words: *Cryptocarya*, Ecuador, IUCN Red List, Lauraceae, Panama.

Cryptocarya R. Br. is one of the larger pantropical genera of the Lauraceae, present in South America, South Africa, Madagascar, Asia, Australia, and Oceania, with an estimated 350 species (van der Werff, 1992, 2008; Rohwer, 1993). The Brazilian species of *Cryptocarya* were recently revised by Moraes (2007), who recognized 13 species. Until the present, except for the Chilean species *C. alba* (Molina) Looser and the French Guianan *C. guianensis* Meisn., the American species of the genus were restricted to Brazil. *Cryptocarya* can be distinguished from other genera of the Lauraceae by its bisexual and trimerous flowers, which are very typical in shape (usually with a slender, urceolate, apically narrowed tube and the ovary immersed in the tube, six equal to subequal tepals, nine fertile stamens with disporangiate anthers, staminal glands only in the third androecial whorl), and by the characteristic fruit that is enclosed by the accrescent flower tube. During the preparation of the treatment of *Cryptocarya* from Brazil by the first author, several extra-Brazilian undescribed species were encountered, among them the Ecuadorian species presented below. An additional new species collected recently in Panama is also described in this contribution, and *C. guianensis* is reported for the first time from Ecuador. As stated by van der Werff and Richter (1996), our lack of knowledge of species numbers and distribution in the Lauraceae is related to the fact that many species are tall trees with small, inconspicuous flowers, difficult to locate and to collect. Flowers are still lacking for several additional species of *Cryptocarya* from Bolivia, Costa Rica, Ecuador, Peru, and Venezuela, and thus these species remain undescribed until good flowering material is collected. It is worth mentioning that no specimen of *Cryptocarya* has been found among the Lauraceae collections at COAH and COL. Vegetatively, the fruiting specimens of *Cryptocarya* are unlike other Neotropical Lauraceae, and several had been identified in the field as Aquifoliaceae, Icacinaceae, and Nyctaginaceae.

New Species of *Cryptocarya*

1. **Cryptocarya panamensis** P. L. R. Moraes & van der Werff, sp. nov. TYPE: Panama. Colón: Teck Cominco Petaquilla mining concession, forested slopes along ridge rd., 08°49′56″N, 80°41′05″W, ca. 250 m, 7 Mar. 2008 (fl.), *G. McPherson 20456* (holotype, PMA; isotypes, MO, SPSF). Figure 1.

A *Cryptocarya moschata* Nees & Mart. et *C. subcorymbosa* Mez gemmis albido- vel pallide flavo-pubescentibus, foliis juvenalibus super glabris, subtus glabrescentibus, foliis adultis ovatis, opacis, inflorescentiis minoribus (1.1–3 cm), florum tubo angustiore, glandulis (0.5–0.7 × ca. 0.6 mm) et staminodiis (0.7–1 × ca. 0.6 mm) majoribus recedit.

Trees, to 20 m; branches cylindrical, with lenticels; branchlets ca. 2.5 mm diam., ca. 5 cm below terminal bud, chestnut-brown to dark brown, angular at the tips, becoming terete toward the base of the branchlets, slightly rugose, glabrous, shiny, with lenticels toward the base; terminal buds minute, ovoid, pubescent, hairs white to light yellow, appressed, buds enclosed by concave scales, these glabrescent to ciliate. Petioles dark brown, 5–8 × ca. 1 mm, canaliculate above, rounded below, rugose, glabrous; leaves alternate, elliptic to ovate, 4.5–11.4 × 1.9–4.3 cm, chartaceous; young leaves glabrous adaxially, glabrescent abaxially, adult leaves glabrous on both surfaces, apex acute to short-acuminate, base acute to obtuse, margin flat, sclerified; both surfaces opaque and densely and prominulously reticulate,

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Figure 1. Isotype of *Cryptocarya panamensis* P. L. R. Moraes & van der Werff (*McPherson 20456*, MO).

abaxially papillate; midrib prominulous adaxially, somewhat impressed to level near the base, prominulous to slightly convex abaxially; secondary veins patent (7 to 10 per side), prominulous on both surfaces; tertiary venation prominulously and densely reticulate on both surfaces; venation pattern camptodromous-brochidodromous. Inflorescences axillary, paniculate, many-flowered, 1.1–3 cm, shorter than leaves, sparsely light yellowish pubescent, with mixed short and relatively long hairs, straight, appressed to

ascending; bracts and bracteoles minute, ovate, densely to sparsely tomentulose, ciliate, deciduous. Flowers yellow-green, with tube manifestly pubescent, tepals sparsely pubescent and glabrescent toward the apex, with relatively long hairs, these appressed to ascending, white to light yellow, 3.3(–4.5) mm long, 1.9(–3.7) mm diam. at apex; tube urceolate, 1.1(–2) mm long, 0.7(–1.2) mm diam.; tepals subequal, free to the base, ca. 2.4 × 1.3 mm, concave, ovate to obovate, apex acute to rounded, with inner surface densely covered with relatively long yellowish hairs, these appressed or ascending; stamens included; stamens of whorls I and II introrse, incurved, 1.2–1.6 mm, anthers sparse pilose, ciliate and papillate, ovate, 0.8–1 × 0.4–0.6 mm, connectives prolonged beyond the large sporangia, tip truncate, filaments pilose, stout, shorter than anthers, adnate to tepals; stamens of whorl III lateral-extrorse, incurved, 1.5–1.7 mm, anthers narrow-ovate, papillate and pilose, ca. 0.9 mm, connectives prolonged beyond the large sporangia, tip acute to truncate, filaments subequal to shorter than anthers, pilose; glands subglobose, 0.5–0.7 × ca. 0.6 mm, pedicel 0.2–0.4 mm, sparsely covered by long yellowish ascending hairs, rather distant from the filaments; staminodes triangular-ovate, flattened, 0.7–1 × ca. 0.6 mm, tip and abaxial side pilose, stalks conspicuous, ca. 0.4 mm, stout, pilose; gynoecium immersed in the tube, glabrous, 2.5–2.9 mm, ovary ellipsoid, ca. 1.2 × 0.6 mm, gradually merging into the style (ca. 1.4–1.7 mm) with small, discoid stigma. Fruits unknown.

IUCN Red List category. *Cryptocarya panamensis* is known only from the type collection and is assessed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. The new species is morphologically similar to *Cryptocarya moschata* Nees & Mart. and *C. subcorymbosa* Mez, both from the Atlantic rainforest in southern Brazil. However, it differs from both mainly in the different indument covering the buds and inflorescences and by the distinctly shorter inflorescences (1.1–3 cm long). Its flowers are relatively smaller, with slenderer tubes, and with glands and staminodes larger than those of *C. moschata*, which reinforces the differences among the species. *Cryptocarya panamensis* resembles *C. aschersoniana* Mez in having young leaves adaxially glabrous and abaxially glabrescent; *C. aschersoniana* is restricted to southern Brazil and is distinct in other characters, for instance, the tertiary venation is immersed or very weakly raised while in *C. panamensis* it is prominulously raised on both surfaces. During a later visit to the type locality, G. McPherson tried to locate the sole known tree of this species, but he found that it had been cut down. This is the first collection of a *Cryptocarya* species from Panama. The three collections known from Costa Rica, all with fruits, differ from *C. panamensis* in having the tertiary venation more coarsely reticulated and represent a different species.

2. Cryptocarya yasuniensis P. L. R. Moraes & van der Werff, sp. nov. TYPE: Ecuador. Napo: Estación Científica Yasuní, Río Tiputini, al NO de la confluencia con el Río Tivacuno, 6 km E de la carr. Maxus, Km 44, desvio hacia el pozo Tivacuno, 0°38′S, 76°30′W, 200–300 m, 28 Aug. 1996 (fl.), *K. Romoleroux 2478* (holotype, QCA; isotype, MO). Figure 2.

A *Cryptocarya riedeliana* P. L. R. Moraes petiolis brevioribus (0.7–1.5 cm vs. 1.2–2.9 cm), canaliculatis vel profunde canaliculatis, foliis ovatis, majoribus (12.5–20 × 6.4–7.5 cm vs. 6–17 × 1.5–4.6 cm), nervis secondariis subtus prominentibus, floribus majoribus (3.6–5 × 2–3.8 mm vs. 3.3 × 4.2 mm), tepalis majoribus (ca. 3 × 1.8 mm vs. 1.7–2.4 × ca. 1 mm), fructibus immaturis majoribus quam fructibus maturis *C. riedelianae* (2.8–3 × 2–2.9 cm vs. 1.9–3.2 × 1.3–2.5 cm) recedit.

Trees, to 20 m; branches cylindrical, thick, brownish, relatively smooth, with lenticels; branchlets light brown to reddish brown, angular to terete toward the base, smooth, glabrous, somewhat shiny; terminal buds minute, enclosed by ovoid bracts, concave, glabrous. Petioles 0.7–1.5 × ca. 0.2 cm, canaliculate to deeply canaliculate above, rounded below, smooth to rugose, glabrous; leaves alternate, ovate, 12.5–20 × 6.4–7.5 cm, coriaceous; adult leaves glabrous on both surfaces, apex acute to acuminate, base acute to obtuse, margin flat, sclerified; reticulation conspicuous on both surfaces, slightly paler abaxially, with papillae usually conspicuous; midrib slightly prominulous to impressed to level adaxially, prominent abaxially; secondary veins erect-patent (4 to 8 per side), prominulous adaxially, prominent abaxially; tertiary venation poorly to prominulously reticulate adaxially, prominulous abaxially; venation pattern camptodromous-brochidodromous. Inflorescences axillary to subterminal, paniculate, many-flowered, 2–6 cm, pubescent, with a mixture of short and long hairs, straight, ascending to erect, yellowish, shorter than leaves; peduncles pubescent; bracts and bracteoles minute, ovate, acute, minutely tomentose, deciduous. Flowers cream, minutely pubescent, with relatively short hairs ± ascending, 3.6–5 mm long, 2–3.8 mm diam. at apex; tube urceolate, ca. 1.6 mm long, 1.3–1.8 mm diam.; tepals equal, ca. 3 × 1.8 mm, concave, ovate, apex obtuse to rounded, with inner surface densely covered by relatively long hairs, mixed appressed and ascending; stamens included; stamens of whorls I and II introrse, ca. 1.8 mm,

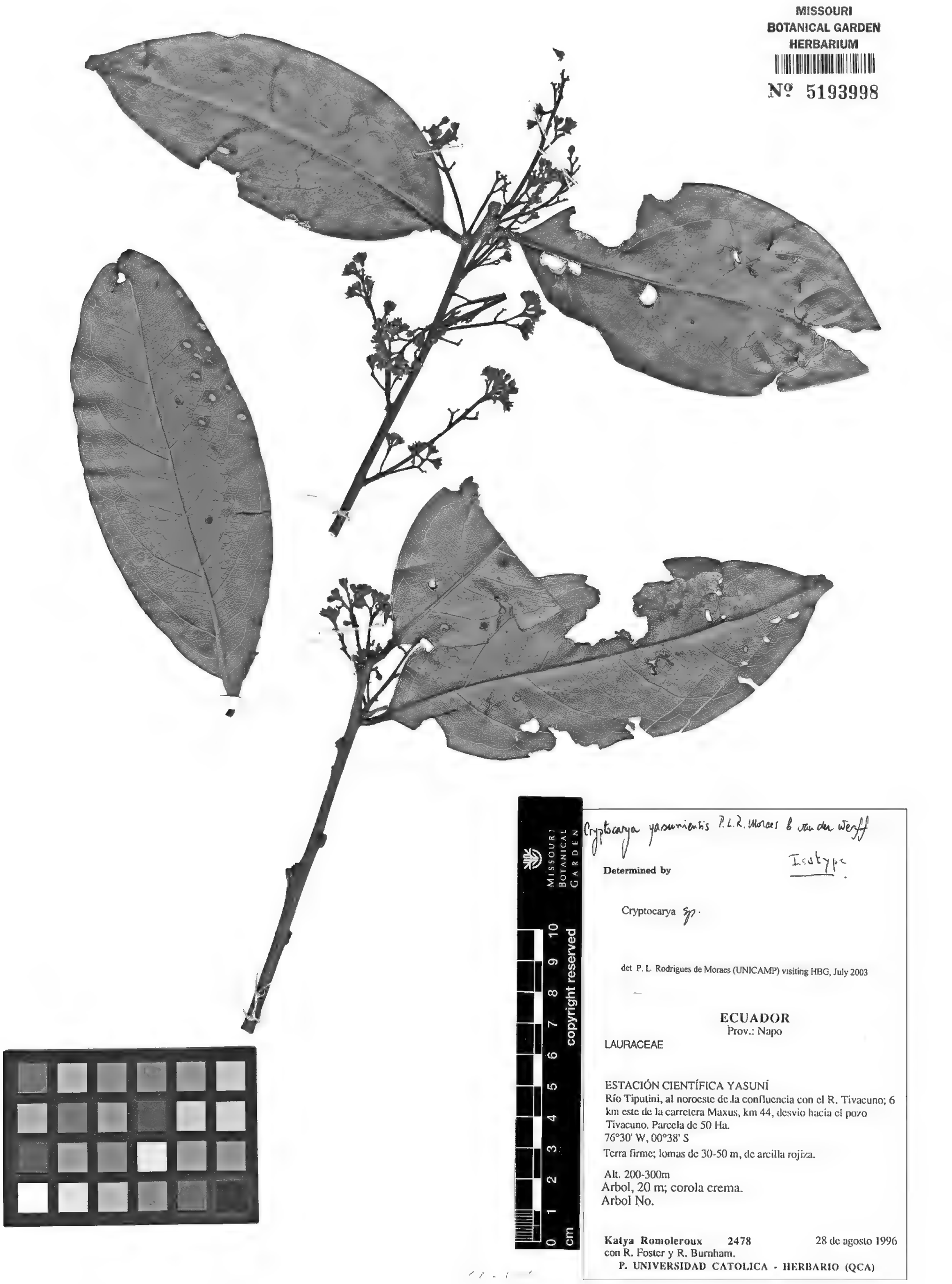

Figure 2. Isotype of *Cryptocarya yasuniensis* P. L. R. Moraes & van der Werff (*Romoleroux 2478*, MO).

anthers ciliate to pilose, triangular, ca. 1.2 × 0.7 mm, connectives prolonged beyond the large sporangia, tip obtuse to truncate, filaments pilose, shorter than anthers, adnate to tepals; stamens of whorl III lateral, erect, ca. 1.8 mm, anthers narrow-ovate, ciliate, ca. 0.8 mm, connectives prolonged ca. 0.3 mm beyond the large sporangia, tip truncate, filaments equal to slightly longer than anthers, pilose; glands subglobose, ca. 0.4 × 0.5 mm, pedicel ca. 0.4 mm, pilose; staminodes relatively large, sagittate, ca. 1 × 0.9 mm,

tip and abaxial side pilose, stalks conspicuous, ca. 0.4 mm, stout, pilose; gynoecium immersed in the tube, glabrous, 3–3.8 mm, ovary globose to ellipsoid, 1–1.2 × 0.6–0.8 mm, gradually merging into the style (ca. 2.4 mm) with small, discoid stigma. Immature fruits ellipsoid to globose, 2.8–3 × 2–2.9 cm, longitudinally ribbed.

IUCN Red List category. *Cryptocarya yasuniensis* is known from only three collections and is listed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Phenology. Plants were observed with flowers in August and with immature fruits in June and October.

Discussion. *Cryptocarya yasuniensis* seems to be closely related to *C. riedeliana* P. L. R. Moraes, known from Bahia, Espírito Santo, and Rio de Janeiro in southern Brazil. However, it can be distinguished by the combination of its short, deeply canaliculate petioles and larger, ovate leaves with secondary veins prominent abaxially. Additionally, its floral characters differ in both size and shape, which allows its specific recognition.

Paratypes. ECUADOR. **Napo:** Aguarico, Res. Etnica Huaorani, carr. Maxus en construcción, Km 61, al sur del Río Tivucano, 0°48′S, 76°23′W, 250 m, 26–30 Oct. 1993 (immat. fr.), *M. Aulestia, M. Ami & R. Ami 996* (MO). **Pastaza:** Río Tigüeno, Quihuaro, 1°16′S, 77°11′W, 230 m, 4 June 1995 (immat. fr.), *J. S. Miller, P. Yépez, Nanka, Coba & Namonka 803* (MO).

First Report of *Cryptocarya guianensis* from Ecuador

As pointed out by Moraes (2007), *Cryptocarya guianensis* is a species infrequently collected in Brazilian Amazonia or in the Guyana Shield region (known mainly from French Guiana). From information available on specimen labels, the species has been reported either as small trees ranging from 4 to 15 m, thus reproducing in the understory, or as large trees up to 25 m. Still, the contrasting colors noted on its bark and sapwood would also suggest it is a rather variable entity or that more than one taxon could be involved. Adopting the current circumscription described in Moraes (2007), the following specimens are here ascribed to *C. guianensis*:

ECUADOR. **Napo:** Cantón Archidona, faldas al sur del Volcán Sumaco, carr. Hollín-Loreto, entre Huamaní y el Río Pucuno (fl.), *W. Palacios & C. Iguago 4637* (HBG, MO, NY); carr. Hollín-Loreto, Km 45 (immat. fr.), *F. Hurtado, D. Neill & A. Alvarado 2798* (HBG, MO), Km 50 (immat. fr.), *W. Palacios 4173* (HBG, MO); Parque Nac. Sumaco-Galeras, S slope of Sumaco volcano (fl.), *J. Homeier & M. A. Chinchero 1882* (MO [2]); Cordillera de Guacamayos, ca. 6 km SE of Cosanga (fl.), *J. Homeier, M. A. Chinchero, E. Jaramillo & L. Guamachin 3140* (MO); Cantón El Chaco, Proyecto Hidroeléctrico Coca, Punto ST3, margen derecha del Río Quijos, ca. 10 km S de Reventador, (fl.), *W. Palacios 5813* (MO), *W. Palacios 5821* (MO, QCNE).

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A New Species of *Typhonium* (Araceae) from Vietnam

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Abstract. A new species, *Typhonium vermiforme* V. D. Nguyen & Croat (Araceae), is described from living materials collected from Quang Binh Province in central Vietnam. It is similar to *T. bachmaense* V. D. Nguyen & Hett. and *T. trilobatum* Schott, but differs from the first species by its much shorter spathe (ca. 9 cm long) and the distinctive, filiform and intertwining staminodes. It differs from the second species in having a solitary leaf and a pedate leaf blade.

Key words: Araceae, IUCN Red List, *Typhonium*, Vietnam.

The previously undescribed species presented here was discovered in Tra Noi, Xuan Trach Commune, Bo Trach District, Quang Binh Province, during fieldwork conducted in cooperation between the Institute of Ecology, Biological Resources (IEBR) and the Royal Botanic Garden, Kew (K) in central Vietnam in 2007. It differs from all other previously described species (Gagnepain, 1942; Sriboonma et al., 1994; Sookchaloem, 1995; Nguyen & Croat, 1997; Sookchaloem & Murata, 1997; Hetterscheid & Nguyen, 2001; Hetterscheid et al., 2001; Nguyen & Vu, 2004; Hetterscheid & Galloway, 2006). Because the plant is very rare in the locations where the type specimen was collected, only one voucher was prepared. Its tuber was cultivated in Hanoi, but unfortunately it did not survive; the plant should therefore be re-collected.

Typhonium vermiforme V. D. Nguyen & Croat, sp. nov. TYPE: Vietnam. Quang Binh Prov.: Bo Trach Distr., Xuan Trach Commune, Tra Noi, 10 Feb. 2010, *V. D. Nguyen, X. P. Vu, R. P. J. Kok, T. A. Utteridge, A. Moore, M. Trudgen & M. Briggs 2104* (holotype, HN; isotype, K). Figure 1.

Haec species quoad folium omnino pedatum ad *Typhonium bachmaense* V. D. Nguyen & Hett. accedit, sed ab eo spatha multo breviore oblonga usque ovata atque staminodiis linearibus acuminatis curvatis differt.

Tuberous plant, to 37 cm tall; tuber cylindrical but subconical at apex, ca. 2.5 × 1.5 cm, dull white outside, white inside. LEAVES solitary; *petiole* ca. 36 cm, encrusted by dark spots on dull brown to light brown background; *lamina* pedate-trisect, with 5 lobes, the middle lobe sessile, lateral lobes attached on stipes 3.5–4 cm, lobes obovate to elliptic or lanceolate or diamond-shaped, 12–14.5 × 5–6.5 cm, dark green on adaxial surface, base obtuse or acuminate, apex obviously cuspidate or acuminate, the acumen 1–2 cm; primary lateral and collective veins distinguished from others; *primary lateral veins* in 7 to 11 pairs, collective veins 3–10 mm from margin. INFLORESCENCE solitary; *peduncle* ca. 5 cm, with only 2 cm emerging from leaf sheath, dull white to light pink, with elongate, light brown dots; *spathe* ca. 9 cm; spathe tube ovate, ca. 1.5 × 1 cm (width at base), dark brown dotted on dull light pink to white background outside; *spathe* lamina oblong to ovate, ca. 4.5 × 1.8 cm (width at widest point), light yellow-green. *Spadix* ca. 16.5 cm; *female portion* conical, ca. 3 × 5 mm (width at base); sterile portion ca. 1.7 cm, curved sterile flowers concealed to 6 mm from base, upper portion empty, smooth; *male portion* cylindrical, ca. 4.5 × 1.5 mm, light pink; appendix stipitate, subulate or narrowly long-tapered, ca. 14 × 0.5 cm (width at base), stipe ca. 1.5 mm, dark yellow in color; *ovary* obovate to bottle-shaped, ca. 1.5 × 0.6 mm; stigma sessile, discoid, ca. 0.2–0.3 mm diam., light pink; stamens sessile; anthers subglobose, dehiscing by apical pores; sterile flowers slender, linear, staminodes twisted and curved together, 3–4 mm, bluntly acuminate, pinkish but yellowish pink at apex.

Distribution and habitat. *Typhonium vermiforme* grows in the gaps between layers of stone on hills and in shady areas of open forest; it is known from one collection made in Quang Binh Province, Vietnam.

IUCN Red List category. *Typhonium vermiforme* is considered here as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001). The species is

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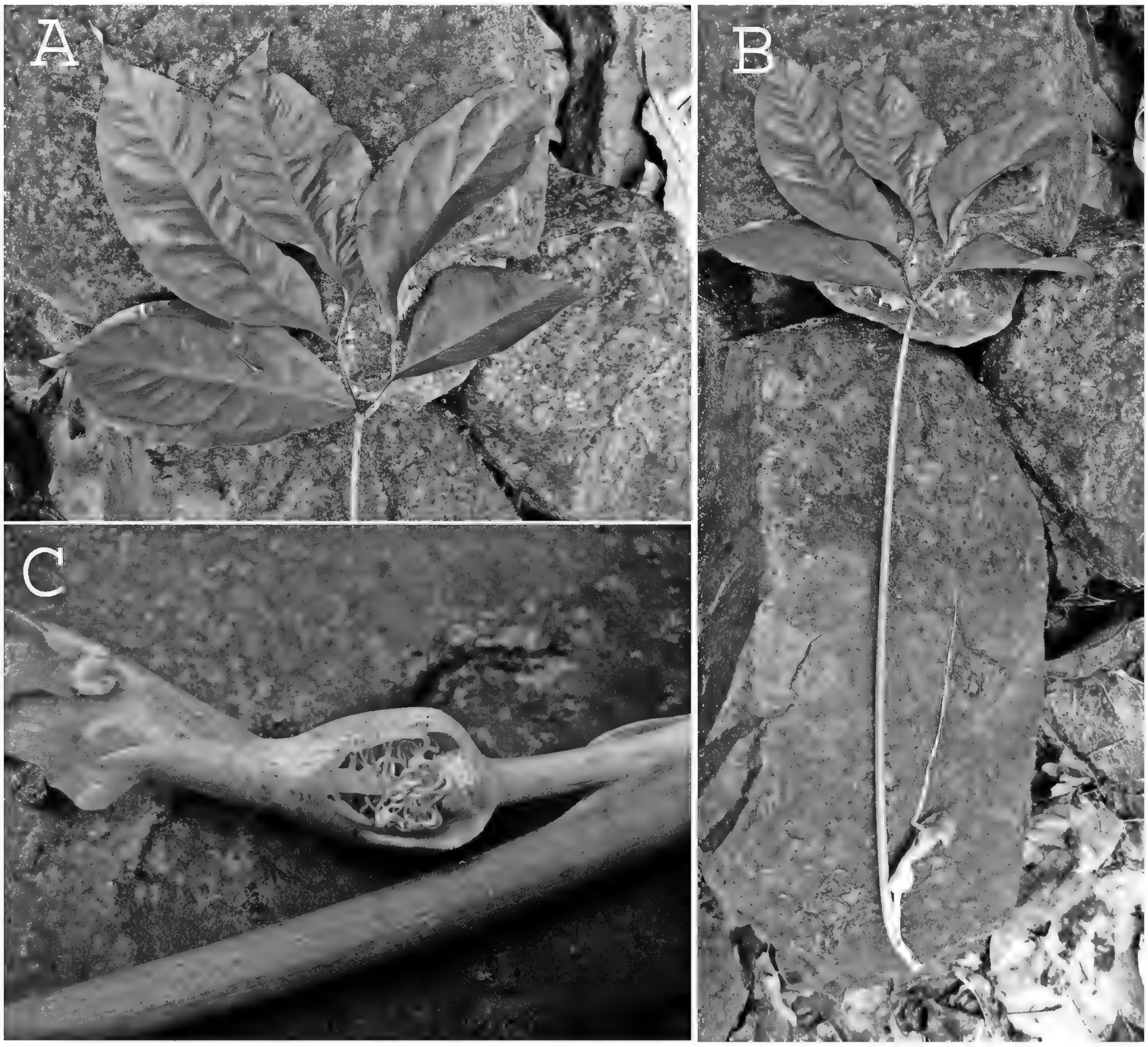

Figure 1. *Typhonium vermiforme* V. D. Nguyen & Croat (*V. D. Nguyen et al. 2104*, HN, K). —A. Close-up of leaf blade with adaxial surface exposed. —B. Entire leaf blade and attached inflorescence (along spadix paralleling petiole). —C. Cutaway section of tube showing pistillate portion and vermiform staminodes. Photos of type specimen by Nguyen Van Du.

known only from a single collection, but the area where it was collected is still poorly known so there is no way to predict how common the species is.

Etymology. The specific epithet is taken from the Latin "vermiformis" and refers to the wormlike appearance of the staminodes.

Relationships. Typhonium vermiforme is most closely related to *T. bachmaense* V. D. Nguyen & Hett. in its fully pedate leaves, a character that is rarely found in the genus. The two species also share similar staminodes, an elongated, subulate appendix, and a short stipe. However, *T. vermiforme* can be distinguished by its much shorter oblong-ovate spathe and its very slender spreading staminodes that are bluntly acuminate at apex and twisted and curved together. *Typhonium vermiforme* may also be confused with *A. trilobatum* Schott but differs from that species in having a solitary leaf and a pedate leaf blade.

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A New Species of *Camellia* Sect. *Stereocarpus* (Theaceae) from Vietnam

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Abstract. A new species of *Camellia* L. (Theaceae), *C. maiana* Orel, endemic to the Da Lat Plateau in southern Vietnam, is described and illustrated. The newly described species has variable-sized, ovate to obovate leaves; 2-whorled, terminal, sessile flowers exhibiting emarginate, opaque to translucently white, finely textured petals; a compound style consisting of four parts that are fused at the base; persistent bracteoles; and a superior 4-chambered ovary. The morphological evidence supports taxonomic placement as a transitional member of *Camellia* sect. *Stereocarpus* (Pierre) Sealy.

Key words: *Camellia*, IUCN Red List, Theaceae, Vietnam.

Camellia L. is a member of the tea family (Theaceae). This genus is well represented in Vietnam, and its species are located throughout most areas of the country. Vietnam is considered a major center of diversity for *Camellia*, having approximately 20% of all the species located within its boundaries (Sealy, 1958; Chang & Bartholomew, 1984). The genus *Camellia* is characterized within the family by having seeds without wings and capsules dehiscing from the apex (Sealy, 1958).

In this paper, a new species within *Camellia* sect. *Stereocarpus* (Pierre) Sealy from Vietnam is described. As the infrageneric classification of the genus varies from author to author, in this study, the taxonomic treatments of Sealy (1958), Chang and Bartholomew (1984), and Ming and Bartholomew (2007) are considered. This section was originally established by Pierre in 1887 and, as constituted by Chang and Bartholomew (1984), it contains five species, namely *C. dormoyana* (Pierre ex Laness.) Sealy, *C. krempfii* (Gagnep.) Sealy, *C. yunnanensis* (Pit. ex Diels) Cohen-Stuart, *C. liberistyla* Hung T. Chang, and *C. liberistyloides* Hung T. Chang (Chang & Bartholomew, 1984). In Ming and Bartholomew's classification system (2007), *Camellia* sect. *Stereocarpus* contains three species, *C. dormoyana* (the type species), *C. pubipetala* Y. Wan & S. Z. Huang, and *C. luteoflora* Y. K. Li ex Hung T. Chang & F. A. Zeng.

Data obtained from the taxonomic evaluation of the new *Camellia* species proposed here indicate a number of morphological characteristics that have established affinities with sections *Brachyandrae* Hung T. Chang and *Furfuraceae* Hung T. Chang (sensu Chang & Bartholomew, 1984). Placement of the proposed new *Camellia* species into section *Brachyandrae* was judged rather tenuous because the shared morphological characteristics were relatively few. Further detailed analysis has shown that the proposed new *Camellia* species possesses a number of, but not all, morphological characteristics exhibited by species in section *Brachyandrae*. The new species also shares some affinities with the members of section *Furfuraceae*; however, placement of the proposed new *Camellia* species into section *Furfuraceae* was also judged inappropriate, as the morphological traits in common were only superficial. In similar cases, Sealy (1958) and Chang and Bartholomew (1984) deemed such species "transitional"; we have followed Sealy's approach and consider the new species proposed here to be transitional in section *Stereocarpus*. A concise description of *Camellia* sect. *Stereocarpus* follows:

Camellia sect. **Stereocarpus** (Pierre) Sealy, Rev. Gen. *Camellia*. 45. 1958. Basionym: *Thea* sect. *Stereocarpus* Pierre, Fl. Forest. Cochinch., fasc. 2: pl. 119. 1887. TYPE: *Camellia dormoyana* (Pierre ex Laness.) Sealy.

Leaf blades 11–18(–25) × 5.5–8 cm. Flowers solitary at the ends of the branches, erect, almost sessile; bracteoles 2 or 4, opposite, inserted close to and much smaller than the sepals, persistent; sepals 5 or 6, large, persistent; petals ca. 12; stamens united with the petals but free above, glabrous; gynoecium glabrous; style 1, 5(or 6)-lobulate.

Camellia maiana Orel, sp. nov. TYPE: Vietnam. Lam Dong Prov.: unnamed mtn., Da Lat Plateau, 19 Nov. 2002, *G. Orel*, *R. Cherry*, *S. Jones*, *B. Mika 21149* (holotype, NSW; isotype, HN). Figure 1.

Haec species a congeneris ad *Camelliam* sect. *Stereocarpum* (Pierre) Sealy pertinentibus floribus albis plerumque non solitariis, petalis 7 vel 8, filamentis abbreviatis 1.3–1.5 cm longis, stylo 4-partito atque ovario 4-loculari distinguitur.

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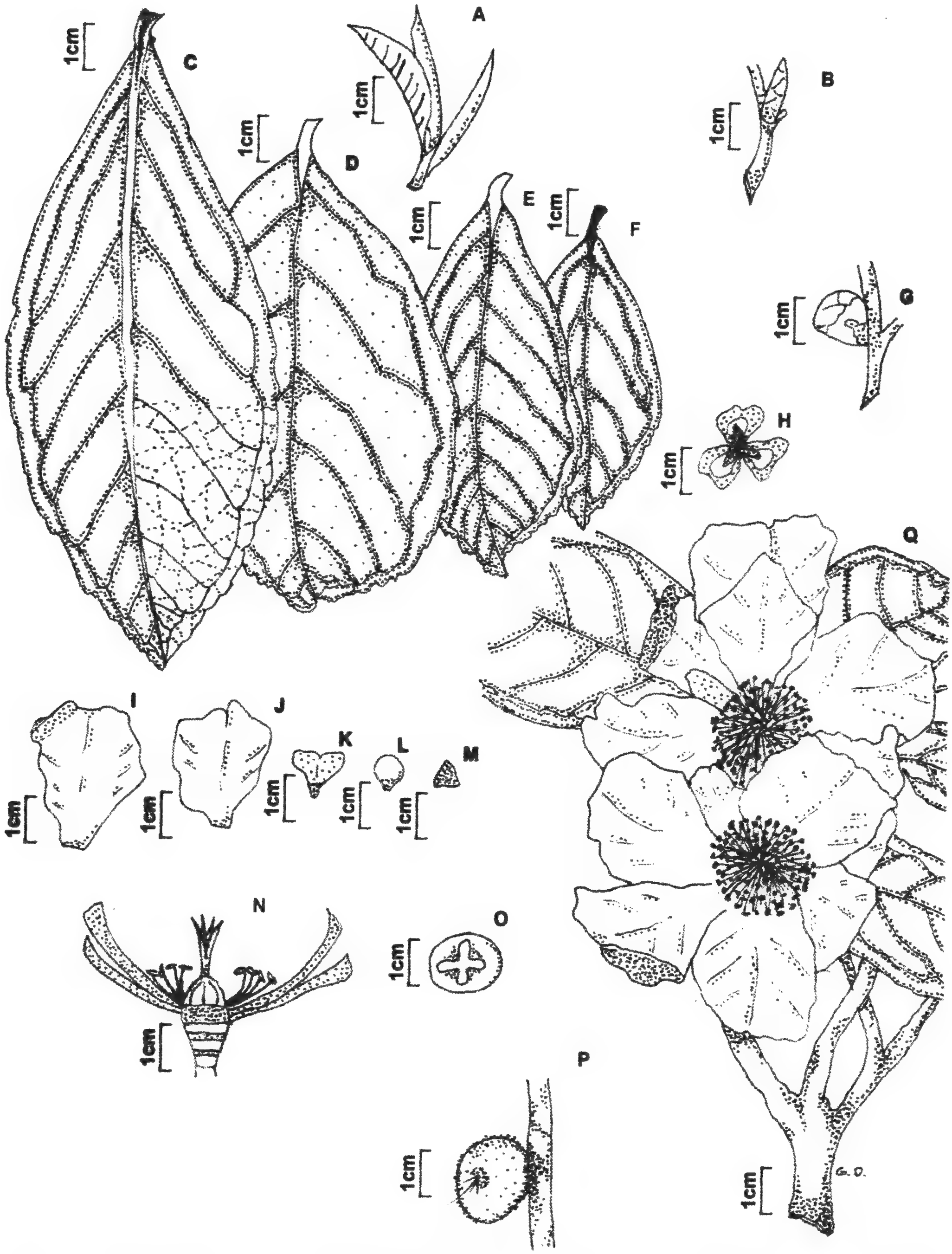

Figure 1. *Camellia maiana* Orel. —A. Juvenile leaf with deciduous leaf sheaths. —B. Terminal leaf bud with leaf petiole. —C. Adult leaf showing primary, secondary, and tertiary venation, adaxial view. —D. Adult leaf and leaf petiole, abaxial view. —E. Adult leaf and leaf petiole, abaxial view. —F. Adult leaf and leaf petiole, adaxial view. —G. Fully developed flower bud. —H. Adult flower, view of sepals, bracts, and bracteoles, proximal end. —I. Petal, first whorl. —J. Petal, second whorl. —K. Sepal. —L. Bract. —M. Bracteole —N. Lateral view of adult flower, showing all flower parts. —O. Adult gynoecium, transverse section. —P. Adult fruit. —Q. Branch with flowers and leaves. Drawn from the holotype *G. Orel et al. 21149* (NSW).

Perennial, small to medium variable evergreen shrub to 5 m high; well branched, rarely multi-stemmed, upright habit; twigs glabrous, green toward terminals, turning entirely light cinnamon brown on semi-mature branches; older branches light to cinnamon brown, to gray and slightly furrowed; trunk light brown with sparse gray striations and slightly furrowed. Leaf petiole slightly falcate and concave, slightly compressed, slender, green above, dark green and shiny beneath, to 7 × 3 mm; petiole ascending, attached at 50° angle to midrib; leaf lamina continues as a 1-mm-high ridge on each side of the adaxial petiole, axillary leaf buds dull green and glabrous at the proximal end, light brown and tomentose at the distal end, elliptic with blunt apex; terminal buds slightly canescent, flattened, falcate with sharp apex, 10–15 × 3–6 mm; developing leaves with 2 to 5 deciduous and overlapping leaf sheaths, yellowish green, 3–3.5 × 0.3–0.5 cm, leaf rigid, initially with coppery sheen, slightly waxy and ascending, adaxial lamina dull green, abaxial lamina slightly lustrous; juvenile leaves variable in both size and shape; mature leaves irregularly but distinctly finely serrate at distal end, serrations oriented abaxially, sometimes smooth at the proximal end, variable, to 10–14 × 5–6 cm; lamina coriaceous, variable, elliptic, oval to obovate to oblanceolate, apex variable, sometimes emarginate, acuminate to cuspidate, base attenuate to rounded; adaxial surface glabrous, green and shiny, lighter green and dull abaxially; blade midrib to 2 mm proximally, < 1 mm distally, light green and dull, adaxially sunken, abaxially prominent; secondary venation pinnate, brochidodromous, with up to 9 pairs of veins adaxially sunken, abaxially prominent; tertiary venation sparse, craspedodromous (Roth-Nebelsick et al., 2001). Flowers sessile, terminal, slightly scented; flower buds round, ca. 10 mm diam., initially green, then mostly white, brown bud scales covering 1/3 of proximal end, flowers in groups of 2 to 4(5), seldom solitary; flowers 5–8 cm diam., soft, opaque to translucent; petals emarginate, white, glabrous, overlapping at proximal end; petals arranged in 2 whorls; the outer whorl of 4 (rarely 3) petals, 3–3.5 × 1.5–2.5 cm, slightly concave, asymmetric, elliptic to oblong, slightly overlapping, petal edges ruffled; the inner whorl of 4 petals, 2–3 × 1.5–2 cm, slightly concave, asymmetric, elliptic to oblong, distinctly emarginate, petal edges ruffled, petal striations slightly raised and of the same color as petal; sepals ca. 0.7 × 1 cm, hairy, bilobate, light green or light brown, lighter toward distal end; bracteoles persistent and woody, in 2 whorls; first whorl with 3 bracteoles, ca. 8 × 7 mm, loosely adpressed to sepals, light brown, hairy, not emarginated; second whorl with 3 to 4 bracteoles, ca. 5 × 5 mm, triangular, woody, tightly adpressed to the first whorl; bracteole bases arise from 0.1-mm-deep indentation where attached to petiole; stamens numerous (250 to 350), in a circular formation, 2–3 cm diam.; filaments abbreviated, 1.3–1.5 cm, yellow, fused in bottom 1/3; anthers yellow to dark yellow, acuminate at the distal end, cordate at proximal end; style compound, distally 4-parted, fused in bottom 1/4, 10–12 mm long, green to yellow, hairy at base, glabrous at top, with an indistinct stigma of the same color; ovary superior, 4-carpellate, each carpel not always bilocular, densely tomentose, 14–18 × 10–12 mm. Mature fruit reddish brown, globose to unevenly ovoid, 15–20 × 9–12 mm, sessile, partially furfuraceous; seed dark brown to black, dull, 8–10 mm, ovoid to hemispherical.

Distribution. *Camellia maiana* is known only from the type collection. The species provenance details are withheld for conservation reasons.

IUCN Red List category. Despite repeated searches (in 2004 and 2005) of the area around the type locality, no other plants were located. Given this situation, we assess the new species as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Phenology. The new species was collected in flower in March; this was followed by fruit maturation in May–July, with fruit capsules dehiscing in late July.

Etymology. The specific epithet honors Phoung Viet Mai and his son Phuoc Viet Mai, who made the collection of this new species possible.

Phytogeographic and Taxonomic Remarks

This endemic species appears to be confined to a small mountainous area of dense rainforest. Further searching of the relevant area is required. The author was not able to find another specimen of *Camellia maiana* in any Vietnamese herbarium. *Camellia maiana* was found within the range of *Camellia* distribution suggested by Sealy (1958) and Gao et al. (2005). Morphologically, the new species is transitional to section *Stereocarpus* (sensu Chang & Bartholomew, 1984), sharing a number of morphological characteristics with some of its members. These include the sessile and terminal flowers (*C. yunnanensis*); free or partially free stamens (*C. liberistyla*, *C. yunnanensis*); free styles (*C. liberistyla*); and eight to 13 persistent bracts and sepals (*C. dormoyana*, *C. liberistyla*, and *C. liberistyloides*).

Camellia maiana differs from the generalized description of section *Stereocarpus* (sensu Chang & Bartholomew, 1984) by possessing flowers that are not

solitary (as does *C. yunnanensis*); seven or eight petals, not 10 to 13 (*C. dormoyana*); a 4-parted style, not 5-parted (*C. liberistyla* and *C. yunnanensis*); and 4-locular, not 5-locular ovaries (*C. dormoyana* and *C. liberistyloides*) (Chang & Bartholomew, 1984).

Camellia maiana also differs from the generalized descriptions of the species of section *Stereocarpus*, as constituted by Ming and Bartholomew (2007) (*C. pubipetala* and *C. luteoflora*), by possessing white flowers that are mostly in groups of four to five and seldom solitary, not yellow flowers that are always solitary (*C. pubipetala* and *C. luteoflora*); by possessing seven to eight petals, not nine to 13 petals (*C. pubipetala*), or seven to nine petals (*C. luteoflora*); by having abbreviated filaments, 1.3–1.5 cm, not 2.5–3 cm (*C. pubipetala*), or very short filaments of 1.2 cm (*C. luteoflora*); by possessing a 4-parted style 1–1.2 cm long, not a 3- or 4-grooved style of unspecified length (*C. pubipetala*), or a 3-parted style (*C. luteoflora*); and by having 4-carpellate ovaries, not 3-carpellate ovaries (*C. pubipetala* and *C. luteoflora*) (Ming & Bartholomew, 2007).

Due to its transitional taxonomic status, *Camellia maiana* shares a number of characteristics with *Camellia* species that belong to sections other than *Stereocarpus*, particularly section *Brachyandrae*. For example, *C. nervosa* (Gagnep.) Hung T. Chang also possesses glabrous branchlets, numerous stamens, a 3- or 4-parted style, and furfuraceous capsules (Gagnepain, 1941; Sealy, 1958; Chang & Bartholomew, 1984). The relatively large leaf size (up to 14 cm) is reminiscent of *C. yangkiangensis* Hung T. Chang (Chang & Bartholomew, 1984). Despite this, *C. maiana* possesses a number of morphological characteristics that place this newly proposed species into section *Stereocarpus* and distinguish it from the species members of section *Brachyandrae*.

Camellia maiana is well distinguished from *C. nervosa* by a number of morphological characteristics. *Camellia maiana* is a small to medium evergreen shrub to 5 m high, not a large upright tree to 20 m (Gagnepain, 1941); with juvenile leaves orange to coppery red (not bright green) and without a prominent yellow midrib; adult leaves ca. 14 × 6 cm (not ca. 7.5 × 3 cm); obovate to ovate leaves (not lanceolate or oblong); leaf petiole 7 × 3 mm (not 6–8 × 5–6 mm); sessile, 2-whorled, terminal flowers in groups of two to four (to five) (not subsessile, 1-whorled, axillary, and solitary); elliptic to oblong, emarginate, opaque to translucent petals (not obovate, non-emarginate, solid colored); and a 4-parted, 10–12 mm compound style (not 3-parted, ca. 14 mm [sensu Gagnepain, 1941, but noted as 4-parted in Chang & Bartholomew, 1984]).

The newly described species also shares some morphological characteristics with *Camellia gilbertii* (A. Chev.) Sealy (sect. *Brachyandrae*), i.e., flowers borne in multiples and similar leaf size, but it differs from it in a number of key morphological characteristics. *Camellia maiana* is a shrub up to 5 m tall, not a small shrub of up to 2 m (Gao et al., 2005). The obovate to ovate leaf shape (not elliptic or oblong-elliptic), the variable acuminate leaf apex (not bluntly acuminate), and the attenuate leaf base (not cuneate) clearly distinguishes *C. maiana* from *C. gilbertii* (Gao et al., 2005). Furthermore, *C. maiana* lacks pedicels, whereas *C. gilbertii* possesses pedicels that are 4–6 mm long. The distinct lack of flower color of *C. maiana* (translucent white) is perhaps the most notable feature that distinguishes the newly described species from *C. gilbertii*, the latter species' flowers being light yellow (Ming & Bartholomew, 2007) or greenish cream (Gao et al., 2005). The flower size of the newly described species seems to be confined to a narrow range, 5–8 cm diam., which is larger than the flower size of *C. gilbertii* (10–17 mm diam.) (Gao et al., 2005).

Due to its transitional taxonomic status, *Camellia maiana* also shares some characteristics with *Camellia* species that belong to section *Heterogenea* Sealy (sensu Sealy, 1958), section *Furfuraceae* (sensu Chang & Bartholomew, 1984), and section *Heterogenea* (sensu Ming & Bartholomew, 2007). Section *Heterogenea* (sensu Sealy, 1958) was established as "a section of diverse species" or "a section of convenience" made up of species that "do not fit easily into any of the other groups of species" (Sealy, 1958) and contains 10 species. Section *Furfuraceae* (sensu Chang & Bartholomew, 1984) is based on the type species, *C. furfuracea* (Merr.) Cohen-Stuart, and contains some eight *Camellia* species. Section *Heterogenea* (sensu Ming & Bartholomew, 2007) contains 14 diverse species. Of this large number of species, only three *Camellia* species, namely *C. furfuracea*, *C. crapnelliana* Tutcher, and *C. gaudichaudii* (Gagnep.) Sealy, have found their way into each of the three taxonomic systems, hence the following comparisons to the type species *C. furfuracea*, as established by Chang and Bartholomew (1984).

Camellia maiana differs from *C. furfuracea* in several phenotypic characteristics. *Camellia maiana* possesses obovate to ovate leaf laminas (not leaves narrow to broad-elliptic [Sealy, 1958], narrowly oblong [Chang & Bartholomew, 1984], or elliptic, oblong-elliptic, or oblong [Ming & Bartholomew, 2007]); a variable, acuminate leaf apex (not bluntly acuminate [Sealy, 1958]); and an attenuate leaf base (not cuneate to obtuse [Sealy, 1958] or cuneate to

broadly cuneate [Ming & Bartholomew, 2007]). Furthermore, *C. maiana* lacks pedicels, whereas *C. furfuracea* possesses pedicels that are 4–9 mm long (Sealy, 1958) or subsessile (Ming & Bartholomew, 2007). The distinct lack of flower color of *C. maiana* (translucent white) is a notable feature that distinguishes the newly described species from *C. furfuracea*, the latter species' flowers being greenish cream (Gao et al., 2005) or white (Ming & Bartholomew, 2007). The flower size of the newly described species seems to be confined to a narrow range, 5–8 cm diam., which is larger than the flower size of *C. furfuracea*, 40–45 mm diam. (Gao et al., 2005) or 20–35 mm diam. (Ming & Bartholomew, 2007). *Camellia maiana* possesses a distally 4-parted style that is fused in the bottom quarter, 10–12 mm long, not a 3-parted free style that is 15 mm long (Chang & Bartholomew, 1984), or a 3- to 5-parted free style that is 14–18 mm long (Gao et al., 2005). The ovary of *C. maiana* is 4-carpellate, not 3-carpellate (Sealy, 1958; Ming & Bartholomew, 2007). *Camellia maiana* produces mature fruit capsules that are globose to unevenly ovoid, 15–20 × 9–12 mm, not globose or oblate, 25–35 mm diam. (Chang & Bartholomew, 1984), or 20–40 mm long (Ming & Bartholomew, 2007).

Many of the species mentioned above have had a varied history. Chang and Bartholomew (1984) accepted both *Camellia liberistyla* and *C. liberistyloides* in section *Stereocarpus*, but Ming and Bartholomew (2007) treated both names as synonyms of *C. yunnanensis* var. *camellioides* (Hu) T. L. Ming in section *Heterogenea*. Chang and Bartholomew (1984) placed *C. yangkiangensis* in section *Brachyandrae* with *C. nervosa*, but Ming and Bartholomew (2007) placed it in synonymy under *C. crassipes* Sealy in section *Theopsis* Cohen-Stuart. Chang and Zeng (1982) had placed *C. luteoflora* in a monotypic section *Luteoflorae* Hung T. Chang; this was maintained by Chang and Bartholomew (1984), but Ming and Bartholomew (2007) included it in section *Stereocarpus*. These examples highlight the unstable nature of the infrageneric classification of *Camellia* and confirm the present authors' view of the unsatisfactory nature of the existing classifications and the need for further supporting evidence.

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Spiranthera atlantica (Rutaceae, Galipeae), a New Species and the First Record of the Genus for the Brazilian Atlantic Forest

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Abstract. A new species of *Spiranthera* A. St.-Hil. (Rutaceae, Galipeinae) is illustrated and described from Espírito Santo, Brazil. *Spiranthera atlantica* Pirani represents the first species record for the genus in the Atlantic Forest of eastern Brazil. The new taxon resembles the Amazonian *S. guianensis* Sandwith but differs by its smaller, few-flowered inflorescences and by the fruit and leaflet morphology.

Resumo. Uma nova espécie de *Spiranthera* A. St.-Hil. (Rutaceae, Galipeinae) é descrita e ilustrada: *Spiranthera atlantica* Pirani, primeiro registro do gênero na Mata Atlântica brasileira. Ela se assemelha a *S. guianensis* Sandwith, que é uma espécie amazônica, mas difere pelas inflorescências pequenas e paucifloras, e por caracteres do fruto e dos folíolos.

Key words: Atlantic Forest, Brazil, Espírito Santo, IUCN Red List, Rutaceae, *Spiranthera*.

The Neotropical genus *Spiranthera* A. St.-Hil. is one of 26 genera forming the subtribe Galipeinae, tribe Galipeae (these names replacing the illegitimate Cuspariinae and Cuspareae, see Kallunki & Pirani, 1998), subfamily Rutoideae, Rutaceae. It is distinguished from other members in the Galipeinae by the following combination of characters: actinomorphic flowers, with five petals free from each other and from the five free, long-exserted filaments; basifixed anthers; and a 5-carpellate ovary borne on a conspicuous gynophore, connate ventrally and 5-lobed above, with an elongate, slender style. The fruit is a schizocarp of one to five mericarps, which are beaked and ventrally dehiscent as follicles.

Three species are recognized for the genus in South America (Groppo & Pirani, 2007). *Spiranthera odoratissima* A. St.-Hil. is a planaltine shrub, widespread in the cerrados (savannas) and open formations of Brazil (Rondônia, Mato Grosso, Pará, Maranhão, Piauí, Goiás, Bahia, and Minas Gerais) and Bolivia (Santa Cruz; *S. leopoldiana* Bamps & A. Robyns, described for Bolivia, is conspecific with *S. odoratissima*). The two other species are Amazonian forest trees or treelets: *S. guianensis* Sandwith, from Guyana, Venezuela, and northwestern Brazil (Roraima, Amazonas, and Acre), and *S. parviflora* Sandwith, from Guyana, Venezuela, and northern Brazil (Roraima, Amazonas, Pará, and Maranhão) (Albuquerque, 1979; Kallunki, 2005).

Two recent collections from Linhares, Espírito Santo, eastern Brazil, represent the first records of the genus for the Atlantic Forest, and the new species is described here. Only adult or fully developed structures from the available herbarium specimens were used for the morphological descriptions. Flowers and fruits were rehydrated before most measurements and sketches were made. Terms used to describe two-dimensional shapes in the descriptions follow the definitions of Hickey (1979). Terms used to describe indumentum follow those of Radford et al. (1974), and terms used to describe inflorescences are those of Weberling (1989).

Spiranthera atlantica Pirani, sp. nov. TYPE: Brazil. Espírito Santo: Linhares, Reserva Nat. CVRD, Estrada Louro, Km 0.3, 12 Jan. 2007 (fl.), *D. A. Folli 5450* (holotype, SPF; isotypes, CVRD, NY). Figure 1.

Species nova *Spirantherae guianensi* Sandwith maxime affinis, quae tamen ab ea cymis paucifloris (20- ad 26-floris, non 50-floris vel plus), ramis floriferis brevioribus (1.2–2.5 cm, non 5–7.5 cm longis), foliolo terminali angustiore (3–5.3 cm, non 5–10 cm lato), disco truncato undulato (non 5-dentato), filamentis glabris (non pilosis) et fructibus rugosis (non transverse striatis) optime distincta.

Tree 5–12 m tall; young buds densely sericeous; branchlets brownish, glabrescent, with sparse lenticels. *Leaves* alternate, 3-foliolate; petiole terete to distally flat, 3–8 cm × 1–1.5 mm, striate, with prominent glands, puberulent mainly at its articulation with the leaflets; petiolules 4–12 mm when terminal, 2–8 mm when lateral, semiterete, puberulent; blade narrowly elliptic to obovate, 8–12.5 × 3–5.3 cm when terminal, 6.5–11.5 × 2–4.6 cm when lateral, base attenuate, apex acuminate (the acumen acute, 5–10 × 1–2 mm), margin flat, chartaceous, pellucid-punctate, adaxial surface olive-green and dull, very sparsely puberulent to fully glabrescent, abaxial surface paler and dull, puberulent mainly on

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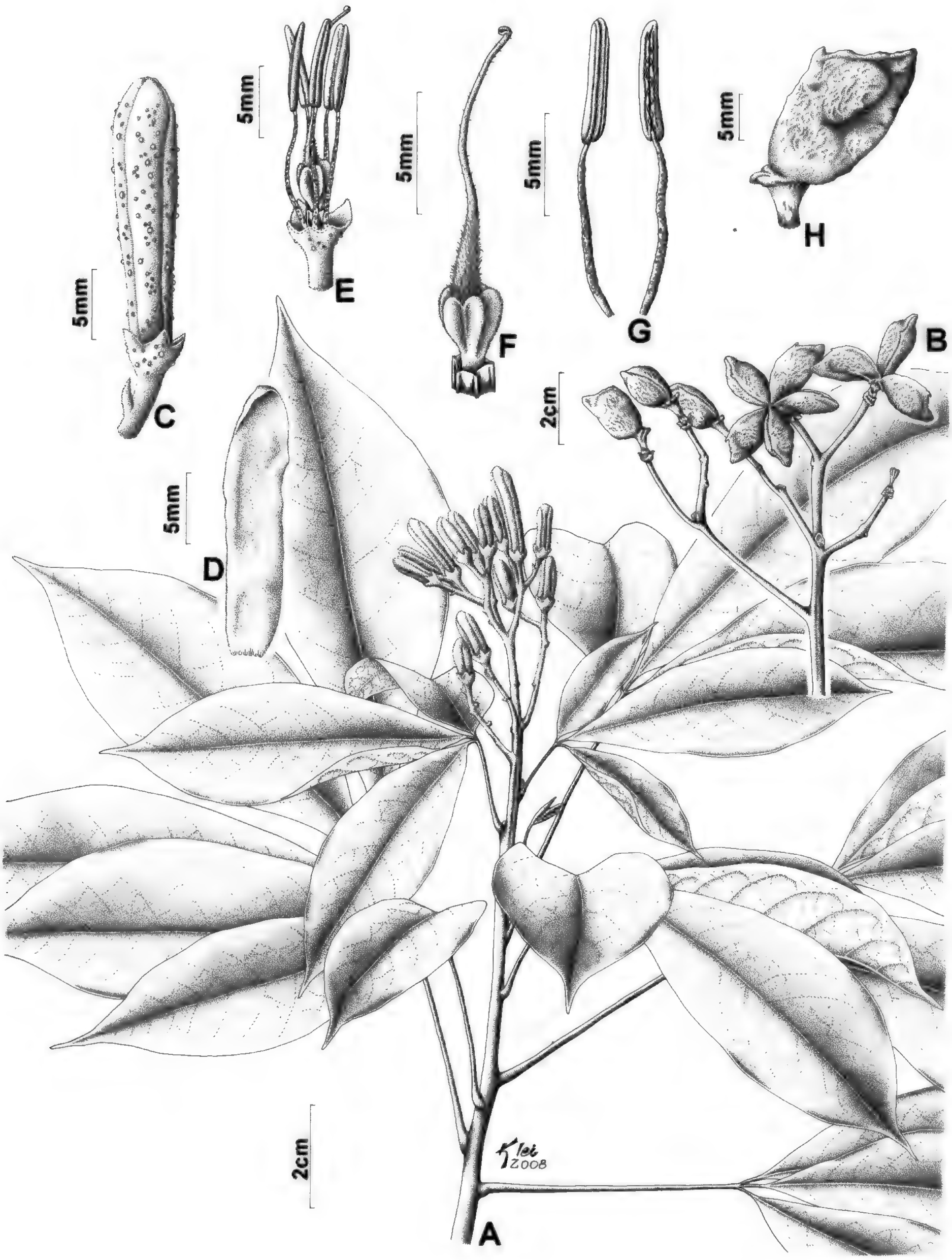

Figure 1. *Spiranthera atlantica* Pirani. —A. Flowering shoot. —B. Infructescence. —C. Floral bud. —D. Petal, adaxial view. —E. Flower, corolla removed. —F. Gynoecium, gynophore, and disc surrounding its base. —G. Stamens, lateral and abaxial views. —H. Immature follicle. A, C–G drawn from *Folli 5450*; B, H drawn from *Folli 4788*.

the veins; venation brochidodromous, midvein canaliculate on the adaxial surface, very prominent on abaxial surface; secondary veins 7 to 9 on each side of midvein, ascendent, arching, canaliculate on the adaxial surface, prominent on the abaxial surface. *Inflorescence* terminal, erect, a small corymbiform cymoid with partial florescences dichasial (usually 3-flowered cymules), with 20 to 26 flowers per inflorescence, few-branched, shorter than the surrounding leaves, 6–8 cm including a puberulent, 0.5–2 cm long peduncle; side-branchlets of first order alternate to subopposite, ascending, the proximal branchlets 1.2–2.5 cm; bracts and bracteoles linear, 1–2 mm, pubescent; pedicel 3–4 mm, puberulent.

Table 1. Comparison of morphological features of *Spiranthera atlantica* and *S. guianensis*.

Characters	*S. atlantica*	*S. guianensis*
Petiole diameter	1–1.5 mm	2–2.5 mm
Petiolule of terminal leaflet	4–12 mm, slender	3–7 mm, thick
Blade of terminal leaflet	8–12.5 × 3–5.3 cm	9–21 × 5–10 cm
Secondary veins on each side of midvein	7 to 9	(7)10 to 12
Proximal branches of inflorescence	1.2–2.5 cm	5–7.5 cm
Flowers per inflorescence	ca. 20 to 26	50 or more
Filaments	glabrous	pilose at base
Disc margin	truncate, undulate	5-dentate
Remnant of style in fruit	prominent, curved	indistinct
Fruit surface	rugose	transversely striate

Flowers with the calyx cotyliform, greenish white, tube ca. 3 mm, pubescent; lobes 5, deltoid, ca. 2 × 2.4 mm, tomentose to pubescent; corolla tubular, rounded at apex in bud, actinomorphic, cream, with several glands; petals 5, imbricate (cochleate), oblong, subacute at apex, 20–22 × 4–5 mm in bud, shortly and densely appressed-pubescent on both surfaces (trichomes on inner surface shorter); stamens 5, alternate to the petals and to the lobes of the disc, glabrous; filaments free, 8–11 mm, flattened, glandular-punctate, glabrous; anthers lorate, 6–7 mm, basifixed, slightly notched at base, the connective glandular-dotted; disc cupular, truncate, undulate, with 5 prominent angles, ca. 1.2 mm high, glabrous; ovary of 5 densely sericeous carpels connate ventrally and deeply 5-lobed above, borne on a slender, glabrous gynophore that is slightly longer than the disc, the combined length of ovary and gynophore ca. 5.9 mm; ovules 2 per carpel; style in bud 12–14 mm long, tomentose at base, sparsely pubescent and gland-dotted above; stigma clavate, slightly 5-lobed. *Fruit* a schizocarp of 1 to 5 rhomboid follicles, stellately arranged, united only by a short median axis, each dehiscent ventrally (by the suture), 12–14 × 10–12 mm, sparsely pubescent to glabrescent, rugose, blackish, with a dorsal obtuse keel terminated by a prominent deltoid beak 4–5 × ca. 4 mm (width at base), and a short, prominent, curved remnant of the style base at the apex of the suture; the calyx and disc persistent at the base of the fruit, the gynophore thickened and elongated up to 6 mm. Mature seeds not seen.

Distribution and habitat. This species is known so far only by two collections from Espírito Santo, eastern Brazil. *Spiranthera atlantica* is found on riverbanks in wet tropical forest and in the mata de tabuleiro, a forest type occurring on patches of Tertiary terrain found among the Quaternary sandy soils that prevail along the Atlantic coast of Espírito Santo.

IUCN Red List category. Because of the scarcity of collections, the new species is assessed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Discussion. The leaves and flowers of the new species are similar to those of the allopatric species *Spiranthera guianensis*, which has a broader Amazonian distribution. They can be distinguished mainly by the characters presented in Table 1.

Spiranthera atlantica can be easily distinguished from the remaining two species of the genus. *Spiranthera parviflora*, an Amazonian treelet, has dense corymbiform inflorescences with numerous small flowers (petals < 1.2 cm vs. > 2 cm long), and *S. odoratissima*, a shrub from the cerrado (Brazilian savannah) and other open formations, has leaflets subsessile and ovate to cordate at the base (vs. distinctly petiolulate and attenuate at base).

The Forest Reserve at Linhares has been studied continuously for years, but the recent collection of this new species shows that the high diversity of the Atlantic Forest in Espírito Santo State is still poorly known and that fieldwork related to botanical inventory is still necessary.

Paratype. BRAZIL. **Espírito Santo:** Linhares, Reserva Nat. CVRD, Estrada Louro, Km 0.4, 24 Mar. 2004 (fr.), *D. A. Folli 4788* (CVRD, SPF).

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A New Species of *Browneopsis* (Leguminosae, Caesalpinioideae) from the Cauca Valley, Colombia

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Abstract. A new species of Leguminosae (Caesalpinioideae), *Browneopsis sanintiae* Silverst., is described from the northern end of the Cauca Valley in the department of Risaralda, in western Colombia. It resembles the Amazonian species *B. ucayalina* Huber, but differs in having one vestigial petal or lacking petals (vs. three to four vestigial petals in *B. ucalayina*), fewer stamens, and pollen usually monoporate (vs. tetraporate in *B. ucayalina*). This is the first report of the genus *Browneopsis* Huber from the Cauca Valley.

Resumen. Una nueva especie de Leguminosae (Caesalpinioideae), *Browneopsis sanintiae* Silverst., se describe del extremo septentrional del valle geográfico del río Cauca, en el departamento de Risaralda, en la parte occidental de Colombia. La especie nueva se asemeja a la especie amazónica *B. ucayalina* Huber, pero difiere en la presencia de un solo pétalo rudimentario o la pérdida total de los pétalos (vs. tres a cuatro pétalos rudimentarios en *B. ucayalina*), menos estambres, y polen usualmente monoporado (vs. tetraporado en *B. ucayalina*). Este es el primer reporte del género *Browneopsis* Huber del valle geográfico del río Cauca.

Key words: *Browneopsis*, Caesalpinioideae, Cauca Valley, Colombia, IUCN Red List, Leguminosae.

Huber (1906) separated the genus *Browneopsis* Huber from *Brownea* Jacq. and recognized two species, *Browneopsis cauliflora* (Poepp.) Huber and *B. ucayalina* Huber. Subsequent botanists, such as Macbride (1943), reunited *Browneopsis* with *Brownea*, but Klitgaard (1991) justified the separation of the two genera, noting that *Browneopsis* differs in lacking bracteoles, in having some or all of the petals reduced in size, in the color of the perianth (white, cream, or rarely pale pink vs. red, orange, or pink [white in one species] in *Brownea*), in the shape of the inflorescence bud (globose vs. ellipsoid to ovoid in *Brownea*), and in the shape and exine ornamentation of the pollen grains (oblate spheroidal and verrucate vs. prolate and reticulate or striate in *Brownea*). She also noted that differences between the two genera in perianth color and pollen exine ornamentation are correlated with differences in pollinators: bats and/or moths in *Browneopsis* versus hummingbirds in *Brownea* (except the white-flowered *Brownea leucantha* Jacq.). Klitgaard recognized 12 species of *Brownea* and six species of *Browneopsis*.

The six species of *Browneopsis* currently recognized are *Browneopsis cauliflora*, known from the Amazonian lowlands of Peru; *B. disepala* (Little) Klitg., known from the southern end of the Chocoan lowlands in northwestern Ecuador; *B. excelsa* Pittier, known from the Darién lowlands of Panama, the Chocoan lowlands and Magdalena Valley of Colombia, and the Amazonian lowlands of Peru and Brazil; *B. macrofoliolata* Klitg., known from a small area at the southern tip of the Chocoan lowlands of Ecuador, possibly extinct; *B. peruviana* (J. F. Macbr.) Klitg., known from the Amazonian lowlands of Peru; and *B. ucayalina*, known from the Amazonian lowlands of Ecuador and Peru. There are more collections of *B. ucayalina* than of all the other species combined. All species are found in lowlands, with altitudinal records ranging from 30 to 850 m.

Since 1986, botanists from the Universidad del Valle have carried out floristic inventories of the few small patches of forest that remain in the Cauca Valley (fewer than 500 ha of forests survive in a valley of 400,000 ha). In 2004, the owner of one of these forests, Hilda M. Sanint-Salazar, collected a specimen that we believed at first to be a species of *Brownea*. After examination of the pollen and floral morphology of this and another specimen collected from the same tree in 2005, we realized that this tree belongs to an undescribed species of *Browneopsis*. This collection represents the first record of this genus from the Cauca Valley.

Browneopsis sanintiae Silverst., sp. nov. TYPE: Colombia. Risaralda: Mpio. Pereira, Hda. Alejandría, Km 7 Cerritos–La Virginia Rd., N end of Cauca Valley, 4°51′27″N, 75°52′49″W, 940 m, 16 Oct. 2005, *P. A. Silverstone-Sopkin, H. Sanint, M. E. Cardona et al. 10442* (holotype, CUVC #40030). Figure 1.

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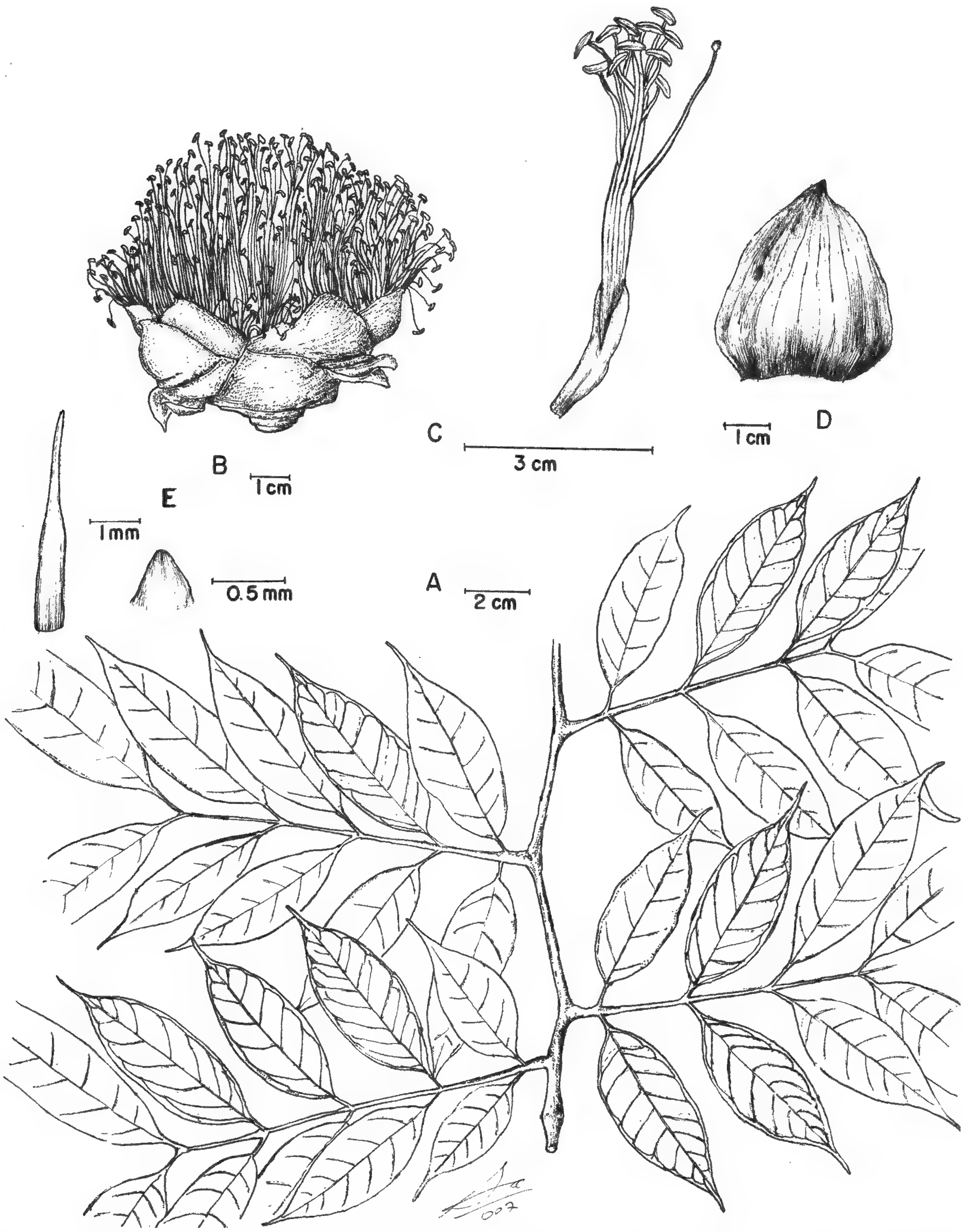

Figure 1. *Browneopsis sanintiae* Silverst. —A. Branch with four leaves. —B. Inflorescence. —C. Flower, showing style, androecium, and sepals attached to the hypanthium (these are not bracteoles). —D. Bract of the inflorescence. —E. Two vestigial petals (from different flowers). Drawn by Silverio Garzón-Gaviria from the holotype, *P. A. Silverstone-Sopkin, H. Sanint, M. E. Cardona et al. 10442* (CUVC).

Haec species a *Browneopside ucayalina* Huber petalo vestigiali uno vel absente, staminibus paucioribus et pollinis granis plerumque uniporis differt.

Trees, 10–15 m tall, 17.5–29 cm DBH; young branches subcylindrical to subquadrangular, with prominent lenticels, youngest parts covered with dense golden tomentum. Leaves alternate, paripinnate, 2- to 5-jugate; petioles 0.3–5 cm, pubescent, rachides 6–52 cm, sulcate on 3 sides (usually not sulcate above), pubescent; leaflets alternate or opposite, petiolules pubescent, 3–12 mm, blades subcoriaceous, progressively longer from proximal to distal pairs, proximal pair 3.8–9.6(–20.5) × 2–3.3(–8.3) cm, other pairs 7.2–12.3(–36) × 2.1–3.9

(–11.5) cm, proximal pair lanceolate to ovate, other pairs lanceolate, elliptic, narrowly elliptic-oblong, or (usually in distal pair) oblanceolate to narrowly obovate, base symmetrical, varying progressively (from basal pair to distal pair) from rounded to obtuse to cuneate, apex caudate, border entire and revolute, adaxial surface with midvein flattened and secondary veins prominulous, glabrous, abaxial surface with midvein raised and prominent, secondary veins prominent, 6 to 13 per side, brochidodromous, midvein golden-villous, blade also golden-villous but trichomes shorter and more scattered than on midvein (blade becoming glabrous in large older leaflets), 1 small flat gland at 1 side of base of abaxial blade surface adjacent to base of midvein or on lateral surface of base of midvein, sometimes obsolete or hidden by dense trichomes. Inflorescence ramiflorous (but not terminal) or cauliflorous, peduncle to 2 cm, inflorescence bud globose, ca. 3 × 3 cm, inflorescence at anthesis a dense capitulum 8–9 × 8–10 cm; bracts 9, white, in 4 series, 50–55 × 30–71 mm, sometimes transversely folded, strongly concave on adaxial surface, ovate to suborbicular, base subtruncate to auriculate (in latter case with subsemicircular sinus), apex acute to rounded, adaxial surface glabrous except scattered pubescence at base, abaxial surface densely pubescent. Flowers ca. 50 to 60 per capitulum, sessile, bracteoles absent, entire flower (to tips of anthers) 58–76 mm; hypanthium 7–14 × ca. 4 mm, pubescent, flat on one side, 4-angled on other side; calyx white, 16–22 mm, partially to completely open on 1 (or sometimes 2) sides, sepals fused in basal 0–11 mm, lobes 2 to 5, unequal, 6–13 × 2–8 mm, adaxial surface partly glabrous and partly sparsely pubescent, abaxial surface densely tomentose; petals 0 or 1, vestigial, ca. 0.5–9 × ca. 0.5–0.8 mm, deltoid to subulate, apex acute to attenuate; stamens 10 or 11, basally connate, tube + free filaments 50–60 mm, filaments fused in basal 16–21 mm, but tube almost completely open on one side (on open side fused in basal 4–5.5 mm), white, glabrous, anthers yellow, versatile, ca. 6 × 1–1.5 mm, glabrous; ovary + style 39–63 mm, ovary pubescent, style and stigma glabrous, stigma subcapitate. Fruit golden brown tomentose, stipe 3–3.5 cm, legume 11.5–25.5 × 3.2–4.4 cm, laterally compressed, not constricted between seeds, both sutures thickened, upper suture with 3 shallow ribs, lower suture with 2 ribs, tip slightly beaked; seeds not seen.

Distribution and habitat. *Browneopsis sanintiae* is known only from small patches of remnant forest at two adjacent haciendas (Alejandría and Córcega) at 940–970 m elevation, at the extreme northern end of the Cauca Valley, near the town of La Virginia. The largest of these remnant forests is only 13 ha. The original forest in this zone was destroyed, beginning in 1915, and was replaced by cattle ranches (Hilda Sanint, pers. comm.).

In the Holdridge system (Holdridge, 1967), this area is classified as Tropical Dry Forest (mean annual precipitation at the adjacent Hacienda La Bohemia is 1764 mm), but this zone is on the border of Holdridge's Premontane Moist Forest. At the highest part of the hill, the forest of Alejandría is secondary, but part of the lower portion (where the type was collected) may be primary forest. This forest was never used as a cacao grove (Hilda Sanint, pers. comm.).

IUCN Red List category. It is probable that *Browneopsis sanintiae* formerly was more widespread in the Cauca Valley and the adjacent piedmont of the Cordillera Central. Because of habitat destruction, it now is extremely rare and should be categorized as Critically Endangered (CR) according to IUCN Red List criteria (IUCN, 2001).

Phenology. *Browneopsis sanintiae* was collected with flowers at anthesis in October and December, with old withered flowers and very young fruits in August, and with large, almost mature fruits in November and December (fruits were collected from different individuals than those from which flowers were collected).

Etymology. This species is named after Hilda M. Sanint-Salazar, owner of the Hacienda Alejandría, in recognition of her contribution to Colombian botany by conservation of the forest of Alejandría, which is the most diverse remnant forest in the Cauca Valley. She has saved several species from extinction; among them are *Bauhinia geniculata* Wunderlin (Leguminosae, Caesalpinioideae; Wunderlin, 2006) and *Plagiolirion horsmannii* Baker (Amaryllidaceae; Meerow & Silverstone-Sopkin, 1995). *Plagiolirion* is the only genus of angiosperms endemic to the Cauca Valley.

Pollen. Pollen of *Browneopsis sanintiae* was observed using both scanning electron microscopy and light microscopy. Grains are in monads and are large and spherical (D1/D2 = 1). Diameters (n = 25) are: D1 = 51.5–57.2 µm (mean 56.1 µm); D2 = 50.4–57.5 µm (mean 56.1 µm). Most grains are monoporate (Fig. 2A), but some are 2-, 3-, or 4-porate. The nexine is 0.8 µm thick, the sexine is 2.7 µm thick, and the total exine is 3.7 µm thick. The surface of the exine is verrucate and is granular between the tubercles (Fig. 2B). Mean measurements of the tubercles are 3.3 µm high and 6.4 µm wide at the base.

In other species of *Browneopsis*, pollen also is verrucate but is 3- or 4-colporate or, in *B. ucayalina*, 4-porate (Klitgaard, 1991).

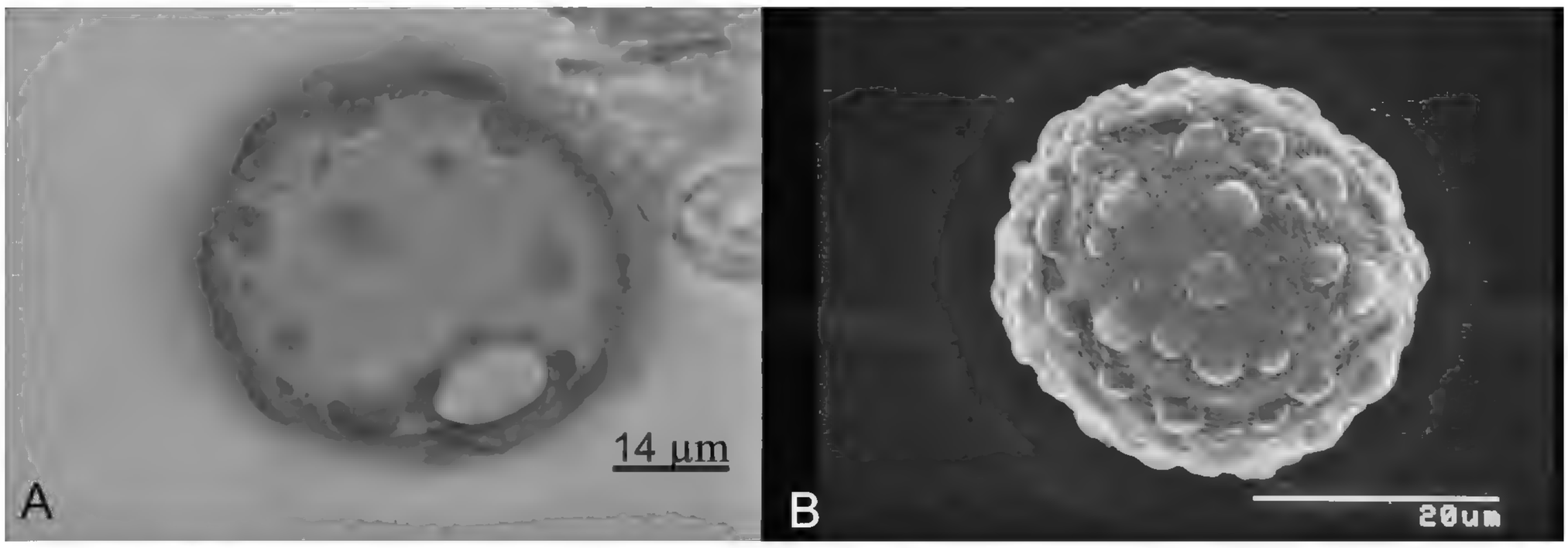

Figure 2. *Browneopsis sanintiae* Silverst. —A. Light micrograph of acetolyzed monoporate pollen grain. —B. SEM micrograph of pollen grain (not acetolyzed), showing verrucate surface of exine. Photographs by Diana Isabel Vergara-Gómez of pollen from the holotype, *P. A. Silverstone-Sopkin, H. Sanint, M. E. Cardona et al. 10442* (CUVC).

Discussion. One of the differences between the genera *Brownea* and *Browneopsis* is the presence of a pair of basally connate bracteoles subtending the flower in *Brownea*, whereas bracteoles are absent in *Browneopsis*. In *Browneopsis sanintiae*, the hypanthium and basally fused sepals resemble the bracteoles of the genus *Brownea*, but the base of the calyx is inserted at the apex of the hypanthium and dehisces circumscissily from the apex of the hypanthium. True bracteoles would insert below the hypanthium and be free from the hypanthium.

Another difference between the genera *Brownea* and *Browneopsis* is the reduction of some of the petals in *Browneopsis*. *Brownea* has five equal, well-developed petals, whereas in most species of *Browneopsis*, the ancestral number of five has been reduced to three or four, at least two of which usually are reduced in length and/or width. In *B. ucayalina*, all remaining petals (three or four) are reduced to tiny vestiges 2–4 mm long (Klitgaard, 1991). This tendency has culminated in *B. sanintiae*, in which only one tiny vestigial petal remains, or in some flowers, the petals have been lost completely.

Klitgaard (1991), Klitgaard and Ferguson (1992), and Knudsen and Klitgaard (1998) noted that pollen grains with a verrucate exine are found in caesalpinioid species that are bat pollinated. Reduction in petal size in *Browneopsis* is probably related to adaptation to a change from diurnal hummingbird pollination to nocturnal pollination (bats/moths), concomitant with a change from red to white flowers and from odorless ornithophily to odoriferous chiropterophily/phalaenophily, as noted in *B. disepala* by Knudsen and Klitgaard (1998). Flowers of *B. sanintiae* are visited by unidentified black wasps by day and by sphingid moths at night (Diana Gamba, pers. comm.).

The only species of *Browneopsis* hitherto reported from Colombia is *B. excelsa*, which differs from *B. sanintiae* in having fewer pairs of leaflets (two or three), usually terminal inflorescences, fewer flowers per inflorescence, at least some petals not reduced in size, flowers sometimes pale pink, more numerous (14 to 16) stamens, and colporate pollen.

Browneopsis sanintiae has fewer pairs of leaflets than *B. disepala* (eight to 11) and more pairs of leaflets than *B. macrofoliolata* (two or three) and *B. peruviana* (one or two); it has fewer stamens than *B. cauliflora* (15 to 20) and *B. disepala* (18 to 26). *Browneopsis sanintiae* differs from five of the six previously described species of *Browneopsis* in the extreme reduction in the number of its petals (none or one) and in its usually monoporate pollen.

Browneopsis sanintiae most closely resembles the Amazonian species *B. ucayalina*, but differs from that species in having the corolla reduced to one vestigial petal or absent (vs. three or four vestigial petals in *B. ucayalina*), fewer stamens (10 or 11 vs. 10 to 18 in *B. ucayalina*), and usually monoporate pollen (vs. 4-porate in *B. ucayalina*).

Paratypes. COLOMBIA. **Risaralda:** Mpio. Pereira, Hda. Alejandría, Km 7 carr. Cerritos–La Virginia, extremo N del valle geográfico del río Cauca, 4°51′27″N, 75°52′49″W, 3 Dec. 2004, *H. Sanint 110* (CUVC), 7 Aug. 1991, *P. A. Silverstone-Sopkin & J. E. Arroyo-Valencia 6247* (CUVC, NY), 15 Oct. 2007, *P. A. Silverstone-Sopkin, H. Sanint, M. E. Cardona et al. 10726* (CUVC); Hda. Córcega, 18 km desde La Virginia por carretera, 7 km W de carr. Cerritos–Cartago por carr. hacia El Trapiche, extremo N del valle geográfico del río Cauca, ca. 4°50′N, 75°53′W, 28 Nov. 1989, *P. A. Silverstone-Sopkin, J. Giraldo-Gensini & H. M. Cabrera 5738* (CAUP, CUVC, NY), 30 Dec. 1994, *P. A. Silverstone-Sopkin & N. Paz 7240* (CUVC).

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assistance in fieldwork. Photographs and measurements of pollen were made by Diana Isabel Vergara-Gómez at the palynology laboratory of the Universidad de Antioquia in Medellín, under the direction of Ramiro Fonnegra. Other SEM photographs (not shown here) were taken by José Arroyave at the Centro Internacional de Agricultura Tropical (CIAT) near Palmira, Valle. I thank Luis Carlos Jiménez-Bulla for permission to examine specimens at the Herbario Nacional Colombiano (COL) of the Universidad Nacional de Colombia in Bogotá. I also thank Jorge E. Ramos-Pérez, José Luis Fernández-Alonso, Jorge Luis Contreras-Herrera, Michael Hopkins, and Silverio Garzón-Gaviria (who drew Fig. 1). Rainfall data for the Hacienda La Bohemia were provided by José T. Bravo-R. (HIMAT, La Unión, Valle). Fieldwork was financed by the Universidad del Valle and by the Departamento Administrativo de Ciencia, Tecnología e Innovación (COLCIENCIAS; grant #1106-05-014-87) to the Universidad del Valle, "Flora Relictual del Valle Geográfico del Río Cauca," Jorge E. Ramos-Pérez, principal investigator.

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A New Species of *Cordia* (Cordiaceae, Boraginales) from Brazil

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Abstract. A new species from Brazil, *Cordia pilosa* M. Stapf & Taroda (Cordiaceae), is described from northeastern Brazil. Illustrations and data on habitat, distribution, and phenology are provided. The new species belongs to *Cordia* sect. *Superbiflorae* Taroda, and it is distinguished from similar species in section *Superbiflorae* by its compact inflorescences and the pilose indument on the twigs, leaves, and inflorescence axes.

Resumen. Se describe e ilustra una nueva especie para el noreste de Brasil: *Cordia pilosa* M. Stapf & Taroda (Cordiaceae). También se presentan datos sobre su hábitat, distribución y fenología. Esta nueva especie pertenece a *Cordia* sect. *Superbiflorae* Taroda, y se distingue de las especies similares de la sección *Superbiflorae* por sus inflorescencias compactas y sus ramas jóvenes, hojas y ejes de las inflorescencias con indumento piloso.

Key words: Bahia, Brazil, *Cordia*, Cordiaceae, IUCN Red List.

Cordia L. is the largest genus of Cordiaceae, with about 250 species, and its distribution is pantropical (Miller, 2001; Miller & Gottschling, 2007). In Brazil, approximately 45 species occur, most concentrated in evergreen lowland and seasonally dry tropical forest. During the study of the Brazilian species of *Cordia*, the taxonomic novelty *C. pilosa* M. Stapf & Taroda was recorded from the states of Alagoas, Bahia, and Sergipe in northeastern Brazil.

Cordia pilosa belongs to *Cordia* sect. *Superbiflorae* Taroda, a natural group distributed mainly in northeastern and southeastern Brazil. This section is characterized by its whitish large corolla (more than 1.5 cm long) and its fruit that is halfway surrounded by the persistent calyx (Taroda & Gibbs, 1986).

Cordia pilosa M. Stapf & Taroda, sp. nov. TYPE: Brazil. Bahia: Entre Rios, rd. Conde–Esplanada, 11°46′17″S, 37°44′05″W, 23 Jan. 2004, *M. N. S. Stapf 228* (holotype, HUEFS; isotype, SJRP). Figure 1.

Haec species inter congeneros ad *Cordiam* sect. *Superbifloras* Taroda pertinentes quoad floribus grandibus *Cordiae superbae* Cham. et *C. rufescenti* A. DC. arcte affinis, sed a hac corolla majore, ab omnibus indumento piloso atque corollae lobis reflexis differt.

Shrub to 4.5 m tall; bark grayish, finely fissured; twigs densely pilose, trichomes ca. 2 mm, brown. Leaves persistent, homomorphic; petioles 1.4–1.7 cm, pilose; blade oblanceolate to elliptic, 24.0–30.2 × 6.4–8.5 cm, apex acute to slightly acuminate, base cuneate, margin entire, adaxial surface glabrescent, with trichomes on the major veins, abaxial surface pilose; venation brochidodromous, midrib slightly prominent or even on adaxial surface, prominent on abaxial surface, secondary veins 11 to 13, tertiary venation reticulate. Inflorescences terminal, cymose, condensed, 4.5–5.8 cm wide, branches as cincinnus, pilose, trichomes 2–3 mm. Flowers bisexual, distylous; calyx tubular, 12.2–13.0 × ca. 6 mm (width at the mouth), striate, unevenly 2-lobed; corolla white, funnel-shaped, 3.8–4.0 cm, lobes reflexed; stamens 5, filaments 13–16 mm, uneven, base pilose, trichomes ca. 1 mm; ovary ovoid, ca. 3 × 1.8 mm, glabrous, style 18–20 mm (short-styled flowers) or 30–34 mm (long-styled flowers), stigmas filiform. Fruit drupaceous, white at maturity, glabrous, surrounded by the slightly accrescent, persistent, cup-shaped calyx, ovoid, 13.5–14.2 × 7.8–8.2 mm, exocarp glabrous, mesocarp mucilaginous, stone erect, ellipsoid.

Distribution and habitat. *Cordia pilosa* is known only from Alagoas, Bahia, and Sergipe in Brazil, where it occurs in the Atlantic coastal forest, specifically in restinga vegetation (sandy plains along the coast), below 100 m in elevation. It is apparently endemic to northern Brazil.

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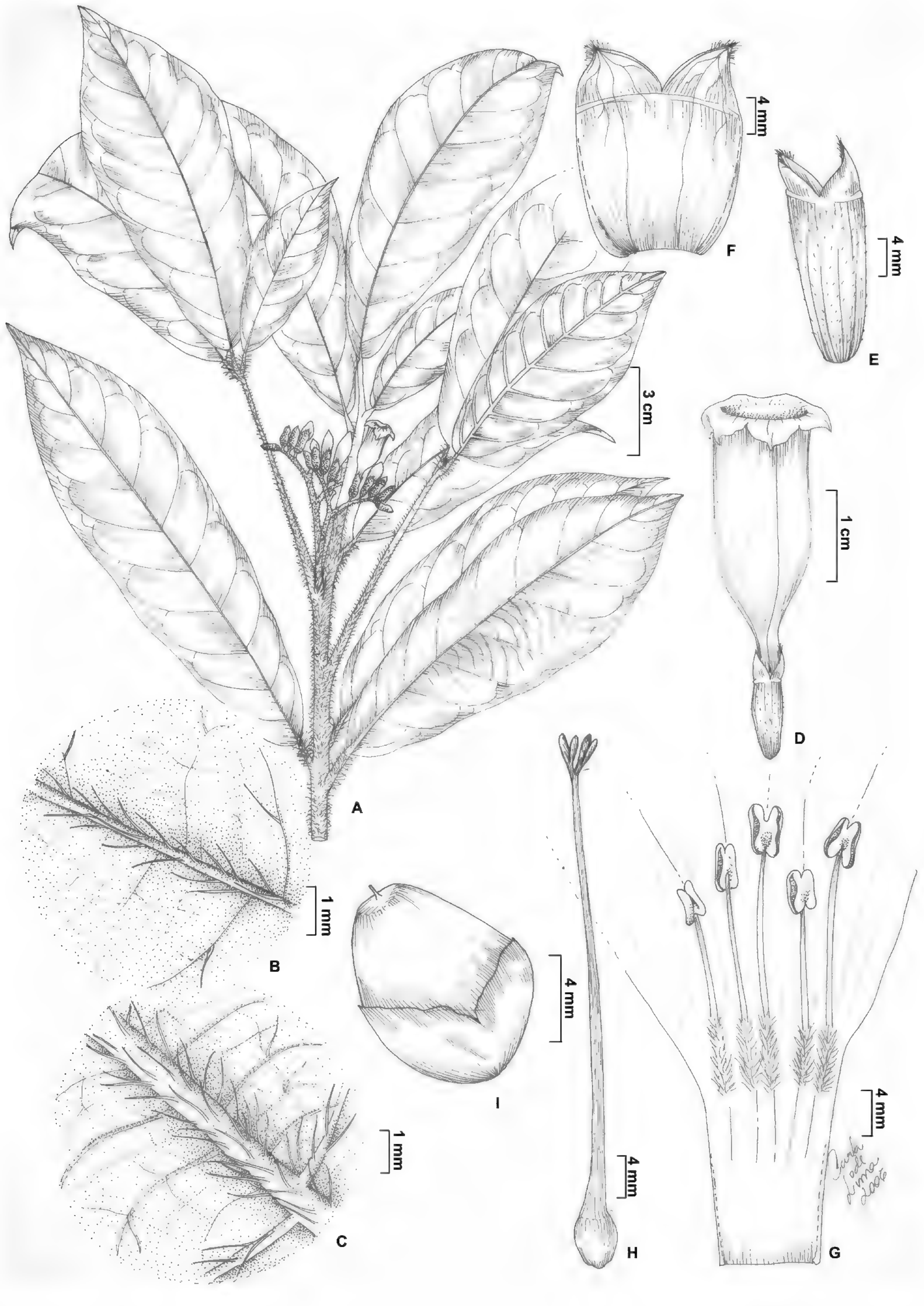

Figure 1. *Cordia pilosa* M. Stapf & Taroda. —A. Flowering branch. —B. Adaxial surface of leaf midportion. —C. Abaxial surface of leaf midportion. —D. Flower. —E. Calyx. —F. Calyx opened. —G. Corolla opened to show the insertion of the stamens. —H. Gynoecium. —I. Fruit. A–H drawn from the type *M. Stapf 228* (HUEFS); I drawn from *M. Stapf 229* (HUEFS).

IUCN Red List category. The species should be considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001). Although it is known from several localities in the altered Atlantic coastal forest region, more information about the numbers of individuals and the extent of the habitat is needed.

Phenology. Flowering specimens were collected in October to March; fruits were collected in January to April.

Relationships. The new species is distinctive and easily distinguished from other species in *Cordia* sect.

Superbiflorae by the pilose indument on the twigs, leaves, and inflorescences axes and by the reflexed corolla lobes. *Cordia pilosa* is closely related to *C. superba* Cham. and *C. rufescens* A. DC., sharing the large flowers (greater than 3 cm long). However, *C. superba* differs from *C. pilosa* by its indument that is scabrous with strigose hairs or often glabrescent, but never pilose, and by the spreading corolla lobes; *C. rufescens* can be distinguished from *C. pilosa* by its villous indument and smaller corolla (3.0–3.5 cm). *Cordia pilosa* appears to be distylous, as reported in other species of *Cordia* (Taroda & Gibbs, 1986).

Paratypes. BRAZIL. **Alagoas:** Limoeiro de Anadia, 11 June 1981, *A. D. Andrade-Lima, R. Pereira & A. Du Bocage 75* (HUEFS); Barra de São Miguel, 25 Mar. 1986, *R. P. Lyra-Lemos & G. L. Esteves 1190* (HUEFS, MAC); Penedo, 14 Nov. 1985, *R. P. Lyra-Lemos & A. T. L. Pinheiro 1103* (HUEFS, MAC); Coruripe, Colônia de Pindorama, 21 Oct. 1998, *R. P. Lyra-Lemos & M. N. Rodrigues 3979* (HUEFS, MAC); Piaçabuçu, Tapera, 22 Oct. 1987, *I. S. Moreira, G. L. Esteves, R. P. Lyra-Lemos, R. S. Nascimento & A. F. L. Pinheiro 59* (HUEFS, MAC); Campo Alegre, Faz. Matão, 25 Nov. 1997, *M. N. Rodrigues, R. P. Lyra-Lemos & J. Santinho 1174* (HUEFS, MAC). **Bahia:** Entre Rios, 11°53′08″S, 37°57′13″W, 25 Feb. 2005, *J. G. Carvalho-Sobrino & A. C. Assunção 347* (HUEFS); São Sebastião do Pessé, Faz. Panema 12°33′S, 38°23′W, 27 Mar. 2001, *G. Carvalho et al. 21* (ALCB); Conde, 30 km from Conde, 25 Mar. 1995, *F. França & E. Melo 1145* (HUEFS); Itanagra, Faz. Brejo Verde, 26 Oct. 1975, *E. F. Gusmão 375* (ALCB); Conceição do Jacuipe, Rio Pojuca, 12°32′S, 39°05′W, 7 Mar. 2003, *M. V. Moraes 575* (HUEFS); Entre Rios, rd. to Imbé, 12°7′40″S, 37°59′14″W, 20 Jan. 2007, *T. S. Nunes, N. K. R. Souza & K. T. R. Souza 1767* (HUEFS); Mata de São João, praia Malhada, 12°30′37″S, 38°00′36″W, 18 Nov. 2005, *A. K. A. Santos, S. F. Conceição & T. S. Nunes 468* (HUEFS); Entre Rios, rd. Conde–Esplanada, 11°45′17″S, 37°45′45″W, 23 Jan. 2004, *M. Stapf 201* (HUEFS, SJRP), *M. Stapf 202* (HUEFS), *M. Stapf 203* (HUEFS), *M. Stapf 204* (HUEFS), 3 Feb. 2004, *M. & D. Stapf 229* (HUEFS, SJRP). **Sergipe:** Indiaroba, rd. to Pontal, ca. 1 km from hwy. SE 100, 11°28′57″S, 37°27′37″W, 19 Aug. 2003, *K. R. B. Leite & A. S. Conceição 337* (HUEFS).

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Review of New World *Alfaroa* and Old World *Alfaropsis* (Juglandaceae)

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Abstract. *Alfaroa* Standl. has five species with a total of 10 taxa ranging from southern Mexico to northern Colombia, although Costa Rica has the most (four), including the type species *A. costaricensis* Standl. A taxonomic treatment of the Juglandaceae for *Flora Mesoamericana* recognizes the new subspecies *A. costaricensis* subsp. *septentrionalis* D. E. Stone from Mexico and Guatemala as a northern variant. Review of *A. guanacastensis* D. E. Stone reduces the species to synonomy under *A. manningii* J. León. The widespread southeastern Asian genus *Alfaropsis* Iljinsk. (= *Engelhardia roxburghiana* Wall.) is monotypic while possessing several morphological and molecular characters somewhat intermediate between New World *Alfaroa* and *Oreomunnea* Oerst., on the one hand, and Old World *Engelhardia* Lesch. ex Blume on the other. Although *Alfaropsis* was proposed in 1993, the generic name was not generally recognized until the phylogeny of extant and fossil Juglandaceae was examined by Manos et al. in 2007.

Key words: *Alfaroa*, *Alfaropsis*, *Engelhardia*, IUCN Red List, Juglandaceae, *Oreomunnea*.

The latest taxonomic treatment of the Juglandaceae provisionally recognized 10 genera in two subfamilies (Manos & Stone, 2001: table 1): Engelhardioideae, which contains *Alfaropsis* Iljinsk. and *Engelhardia* Lesch. ex Blume from the Old World and *Alfaroa* Standl. and its sister genus *Oreomunnea* Oerst. in the New World; and the Juglandoideae, including *Platycarya* Siebold & Zucc., *Cyclocarya* Iljinsk., *Pterocarya* Kunth, and *Annamocarya* A. Chev. (probably best recognized as section *Rhamphocarya* W. E. Manning & Hjelmq. of the genus *Carya* Nutt. [Manning & Hjelmqvist, 1951]) found extant only in the Old World, and *Carya* and *Juglans* L. occurring in both the New and Old World (Manning, 1978; Manchester, 1987). Because of the distinctive, fossilizable fruit, another nine or so genera are known from the fossil record dating back to the early Eocene (Manchester, 1987). Of the extant genera, however, *Alfaroa* is the only member not represented in the fossil record, although pollen of the *Alfaroa–Oreomunnea* clade is known from Mesoamerica (Graham, 1976, 1985).

The most recent taxonomic assessment of *Alfaroa* (Stone, in press) recognizes five species, four subspecies, and one putative hybrid (*A. costaricensis* Standl. × *A. williamsii* Ant. Molina = *A. costaricensis* var. *elongata* W. E. Manning [Stone, 1977; Morales, 2007]): *A. costaricensis* (with subspecies *costaricensis* and *septentrionalis* D. E. Stone), *A. guatemalensis* (Standl.) L. O. Williams & Ant. Molina, *A. manningii* J. León, *A. mexicana* D. E. Stone, and *A. williamsii* (with subspecies *williamsii* and *tapantiensis* D. E. Stone) (Table 1). The type species of the genus, *A. costaricensis*, was described by Paul C. Standley from El Muñeco in Costa Rica as "perhaps the richest locality botanically that I have ever seen" (Standley, 1927: 77). The trees reached canopy status in the moist, premontane rainforests that once were, but they are also quite capable of flowering and fruiting when mere shrubs or at least subcanopy trees. While *Alfaroa* and *Oreomunnea* are distinctive in the family because of their compound leaves that have opposite phyllotaxy, the type species stands apart from other species of *Alfaroa* because of its short, almost obsolete petioles (0.4–2[–3] cm), very small lowermost leaflets (less than one third the length of the longest), and above all a hirsute pubescence that covers the petiole, rachis, abaxial leaflet surface, and the moderate-sized (2–3 cm) fruit that is superficially walnut-like. The typical *A. costaricensis* subsp. *costaricensis* (Fig. 1) is found in the mountains of Costa Rica and Panama, but a close congener known from a few collections in Mexico and Guatemala is described here as a new subspecies. It should be noted that this taxon has not been found in Honduras and Nicaragua, even though each of these intervening countries has a representative of the genus.

A New Subspecies of *Alfaroa costaricensis*

1. Alfaroa costaricensis Standl., J. Wash. Acad. Sci. 17(4): 78. 1927. TYPE: Costa Rica. Cartago: in moist forests at El Muñeco, S of Navarro, ca. 1400 m, 8 Feb. 1924, *P. C. Standley 33620* (holotype, US 1226388).

1a. Alfaroa costaricensis subsp. **costaricensis**.

1b. Alfaroa costaricensis subsp. **septentrionalis** D. E. Stone, subsp. nov. TYPE: Guatemala.

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Table 1. Distinguishing features of six closely related taxa of *Alfaroa*.

Character	*A. costaricensis* subsp. *costaricensis*[1]	*A. costaricensis* subsp. *septentrionalis*[2]	*A. guatemalensis*[3]	*A. manningii*[4]	*A. mexicana*[5]	*A. williamsii*[6]
Distribution	Costa Rica, Panama	Mexico, Guatemala	Guatemala, Honduras, Mexico	Costa Rica	Guatemala, Mexico	Nicaragua, Costa Rica, Panama, Colombia
Basal pair leaflets	highly reduced	highly reduced	only slightly reduced	only slightly reduced	only slightly reduced	moderately reduced
Petiole:						
length	short (0.4–2[–3] cm)	short (0–1[–2.5] cm)	long (3.5–7 cm)	long (2–9 cm)	long ([2.5–]3–4[–10] cm)	variable ([1.5–]2–5[–7] cm)
hairs	densely hirsute	lightly hirsute	glabrous	glabrous	glabrous	glabrous
Rachis	densely hirsute	lightly hirsute	glabrous	glabrous	glabrous	glabrous
Petiolule	absent to very short (0–1 mm)	absent to short (0–3 mm)	long (3–8 [–10] mm)	variable ([1–]2–5[–10] mm)	variable ([2–]5–8[–10] mm)	short (1–3 mm)
Abaxial leaflet surface:						
pubescence	yes	no	no	no	clustered at base	no
revolute at base	sometimes	no	no	sometimes	yes	no
peltate scale density	sparse	sparse	dense	dense	dense	moderate
Leaflet base	truncate or rounded	obliquely tapering	wedge-shaped to rounded	wedge-shaped to rounded	wedge-shaped to rounded	tapering or rounded
Male flower pedicel	long	unknown	obsolete	obsolete	obsolete	± sessile
Female flowers	hirsute	glabrous to lightly hirsute	glabrous	glabrous	glabrous	glabrous
Fruit	hirsute	glabrous	glabrous	glabrous	glabrous	glabrous

[1] Standley, 1927.
[2] This paper.
[3] Williams and Molina, 1970.
[4] León, 1953.
[5] Stone, 1968.
[6] Molina, 1968.

Quetzaltenango: 14°43′N, 91°31′W, 1600 m, 17 May 1966, *D. E. Stone 2210* (holotype, DUKE; isotype, MO). Figure 2.

Haec subspecies ab *Alfaroa costaricensi* Standl. subsp. *costaricensi* foliorum petiolo rachideque parce (vs. dense) hirsutis, petiolulis 0–3 (vs. 0–1) mm longis, foliolis basi attenuatis usque rotundatis (vs. truncatis, rotundatis vel attenuatis) subtus in aetate omnino glabris, floribus femineis parce (vs. dense) hispidis atque fructu glabro (vs. dense hirsuto) distinguitur; etiam Mexico et Guatemala (vs. Costa Rica et Panama) habitat.

Trees or large shrubs evergreen, to 25 m tall and 70 cm DBH; buttresses small or absent; *bark* tight, lenticillate, reddish brown on exterior, pale yellow on interior; *wood* whitish on outer flanks; *pith* of previous year's growth solid; *terminal buds* unprotected by bud scales, though covered with hairs and peltate scales. *Leaves* compound, even-pinnate, opposite, occasionally whorled, or infrequently alternate; *petioles* 0–1 (–2.5) cm, lightly hirsute; *rachises* 10–15(–30) cm, lightly hirsute; leaflets 14 to 24, basal pair conspicuously reduced compared to the longest ones to < 1/3 the length, or often obscured or lost; *petiolules* sessile to 3 mm; blades obliquely tapered at base, flat, margins serrate on seedlings and saplings, entire or with occasional serrations on mature trees, both surfaces glabrous but with a light density of peltate scales abaxially, and sometimes glaucous adaxially. *Staminate inflorescences* terminal. Mature *staminate flowers* and *pollen* unknown. *Pistillate inflorescences* terminal. *Pistillate flowers* numerous along erect axis; *floral cup* without pedicel, 3-lobed bract and 2 fused bracteoles forming a low rim subtending 4 sepals fused below and a lightly hirsute *ovary*, peltate scales dense; *style* 1, long, bifurcate with deep clefts; *stigma* 2-parted, carinal orientation (stylar arms orthogonal to primary septum). *Fruit* a drupaceous nut, 8-chambered, sessile, ellipsoid to ovoid, ca. 3 × 2–2.5 cm;

Figure 1. Herbarium sheet of *Alfaroa costaricensis* subsp. *costaricensis* (*Stone 2174*, DUKE), from Costa Rica, with opposite phyllotaxy, sessile leaflets with revolute margins at base, and a terminal pistillate spike. Scale bar = 17.5 mm.

husks glabrous, or rarely with a few hairs, sometimes glaucous; *shell* + husk 1–2 mm, cartilaginous; *seed* germination hypogeal. *Seedlings* with first aerial leaves compound, serrate, opposite.

Distribution, habitat, and IUCN Red List category. Alfaroa costaricensis subsp. *septentrionalis* is known from southeastern Mexico (Chiapas, Veracruz) and western Guatemala (Huehuetenango, Quetzalte-

Figure 2. Holotype of *Alfaroa costaricensis* subsp. *septentrionalis* (*Stone 2210*, DUKE), from Guatemala, with opposite phyllotaxy, very short petiolulate leaflets showing only the slightest indication of revolute margins at base, and a terminal pistillate spike. Scale bar = 19.5 mm.

nango, Suchitepéquez). The Veracruz plants on Volcán Santa Marta are on the northeastern side of the Istmo de Tehuantepec and effectively isolated from the Mexican and Guatemalan highlands, where the other collections have been made. The trees occur on rich volcanic soil at 1300–1700 m in ecological conditions favorable for mountain-grown coffee, as is the case for a number of black walnut species (Stone et al., 2009). The current conservation status of this subspecies is unknown, and the IUCN Red List

Table 2. Comparison of *Alfaropsis* with its three closest relatives (Engelhardioideae). Based on Iljinskaya (1990, 1993), Manchester (1987), Manning (1949), Stone (1972), and Manos and Stone (2001).

	Alfaropsis	*Engelhardia*	*Alfaroa*	*Oreomunnea*
No. of species	1	4 to 8	5	2
Extant range	SE Asia	SE Asia	Latin America	Latin America
Habit	evergreen	deciduous	evergreen	evergreen
Phyllotaxy	alternate	alternate	opposite	opposite
Leaflet:				
base	flat	flat	sometimes revolute	sometimes revolute
margin	entire	entire/serrate[1]	entire (serrate)[2]	entire (serrate)
ultimate venation	open	open	closed	closed
rhombic crystals in parenchyma	absent	absent	present	present
abaxial surface:				
texture	flat	flat	papillose	papillose
stomata	surface	surface	sunken	sunken
Inflorescence:				
arrangement	androgynous panicle (separate)[3]	separate	androgynous panicle (separate)[3]	androgynous panicle (separate)[3]
position	terminal (lateral)[4]	lateral	terminal (lateral)[4]	terminal (lateral)[4]
location	new wood (old)[5]	old wood	new wood (old)[5]	new wood (old)[5]
Male flower:				
receptacle	rounded	elongate	rounded	rounded/elongate[6]
floral segments	2	2 to 4	4 to 7	2 to 4
pollen:				
size	14–15 μm	17–22 μm	20–26 μm	20–26 μm
wall	nexine thick	nexine thin	nexine thick	nexine thick
aperture	oblong to circular	elongate	oblong to circular	oblong to circular
Female flower:				
stigma:				
orientation	split carinal	commissural[7]	carinal[8]	carinal
shape	globose	elongate	globose	globose
style	lacking	elongate	lacking	lacking
bract	3-winged	3-winged	rudimentary	3-winged
wing venation	pinnate	pinnate	NA	triveined
bracteoles	proximal rim	proximal flap	rudimentary scale	proximal flap
cells at base	4	2(to 4)	8	8
cotyledons	entangled	entangled	separate	separate
germination	epigeal	epigeal	hypogeal	hypogeal
Phylogenetic affinities[9]	sister to *Oreomunnea* and *Alfaroa* clade	sister to all Engelhardioideae genera	sister to paraphyletic *Oreomunnea*	paraphyletic to *Alfaroa*

NA, data not available.
[1] Leaflets entire in some species; serrate in others.
[2] Leaflets mainly entire in adult plants; serrate in juveniles and sucker shoots.
[3] Mainly androgynous; sometimes separate.
[4] Mainly terminal on new wood; occasionally lateral, and if so on old wood.
[5] Mainly on new wood; occasionally on old.
[6] Compact and rounded in one species; elongate in the other.
[7] Stylar arms parallel to primary septum.
[8] Stylar arms orthogonal to primary septum.
[9] cpDNA/ITS (see Manos et al., 2007).

category is assessed as Data Deficient (DD) (IUCN, 2001). In 1952, however, Manning (1952: 354) noted that "the tree is plentiful in some regions...and...is particularly plentiful in the mountain forest along the old road between Finca Pirineos and Patzulín, Quezaltenango"; I found this to still be true in 1971. However, one cannot be sanguine about the conservation of any plant that has similar ecological requirements to a commercial crop such as coffee. This is particularly true in Guatemala where forests covered 65% of the total land area in 1950, but only 26% remained forested in 2000. As Loening and Sautter (2005: 393) have noted

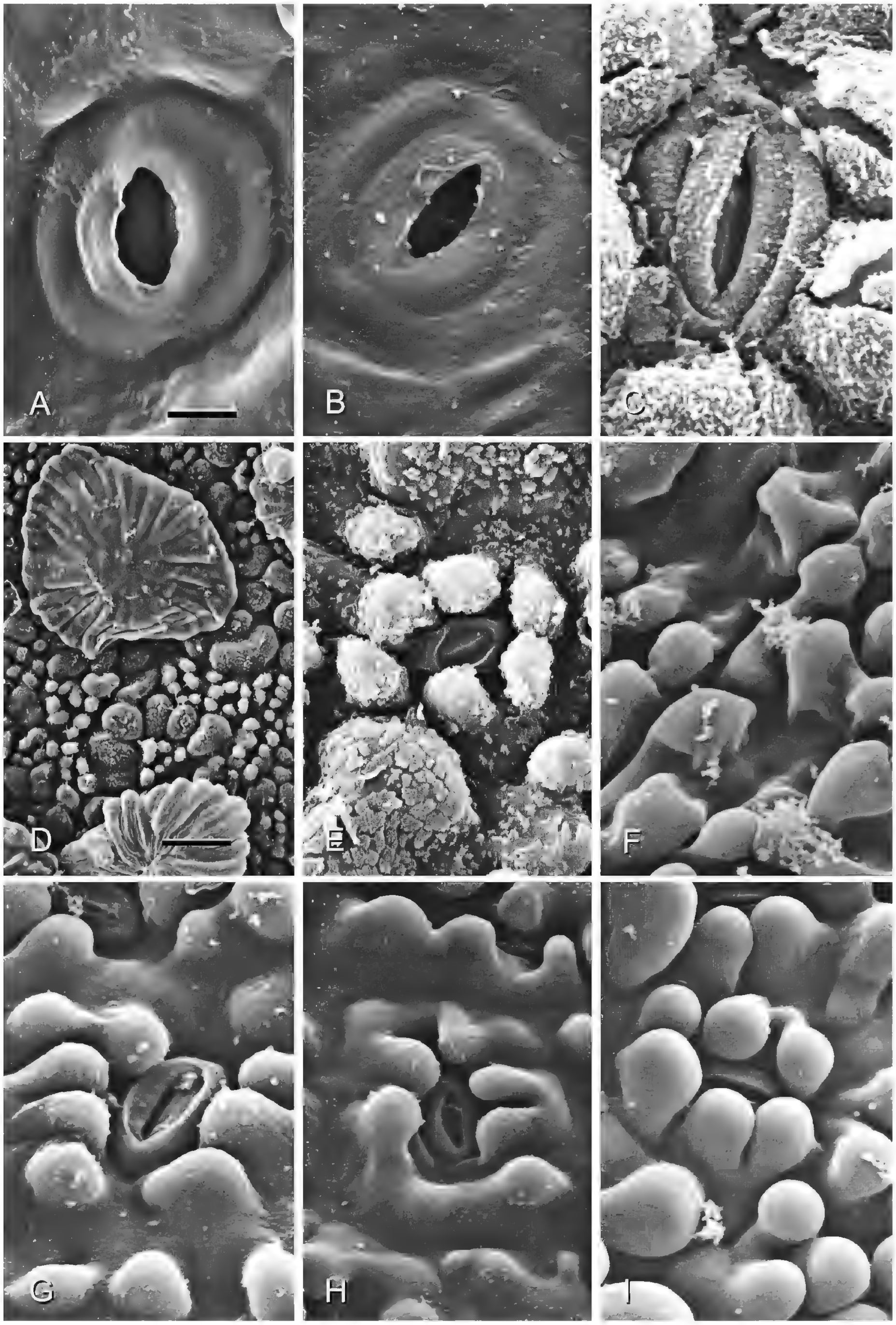

Figure 3. SEM images of abaxial leaf surface of members of the Engelhardioideae. —A. *Engelhardia spicata* Lesch. ex Blume var. *colebrookeana* (Lindl. ex Wall.) Koord. & Valeton (*Tsang 24*) with exposed stomate embedded in a relatively smooth, but undulating epidermis. —B. *Alfaropsis roxburghiana* (Wall.) Iljinsk. (*Clemens 3836*) stomate and epidermal surface similar to Figure 3A. —C. *Oreomunnea pterocarpa* Oerst. (*Stone 1016*) stomate surrounded by five to six wax-encrusted papillae; epidermal surface studded with papillae. —D. *Oreomunnea mexicana* (Standl.) J.-F. Leroy subsp. *costaricensis* D. E. Stone (*Stone 3287*) with stomate partially obscured by epidermal papillae and peltate scales. —E. *Oreomunnea mexicana* subsp. *costaricensis* (*Stone 3287*), devoid of peltate scales to expose stomata with six overarching papillae. —F. *Alfaroa costaricensis* subsp. *costaricensis* (*Stone 2174*) with partially collapsed papillae on the surface of an immature leaf. —G. *Alfaroa*

"from the 19th century until the early 1970s, the expansion of agricultural land was mainly due to the production of export crops [like coffee]."

Historical background. In Manning's 1952 treatment of the Juglandaceae for the *Flora of Guatemala*, *Alfaroa costaricensis* was the only species recognized. We now know, however, that the sterile specimens he referred to as "*Engelhardtia*" *guatemalensis* Standl. are, in fact, *A. guatemalensis* (Standl.) L. O. Williams & Ant. Molina (Williams & Molina, 1970). While dealing again only with sterile specimens, he noted that the status of the Guatemalan *A. costaricensis* is "somewhat uncertain...but the leaves are so closely like those of Costa Rican *Alfaroa* that the Guatemalan tree probably belongs at least to that genus [whereas]...it is to be expected that [the specimens] represent a distinct species" (Manning, 1952: 354). Manning was unable to identify any specific set of characters that could be used to distinguish *Alfaroa* specimens from these two countries. Flowering and fruiting specimens made subsequently in the same general area in western Guatemala, as well as Veracruz (Narave, 1983) and Chiapas, Mexico, now permit a more complete assessment and justification for recognizing northern specimens of *A. costaricensis* as a new subspecies.

Paratypes. GUATEMALA. **Quetzaltenango:** slopes of Volcán Santa Maria, Finca Pirineos, off Hwy. 95 at 197 Km mark, ca. 1600 m, 3 Nov. 1967, *D. E. Stone 2210, 2210A* (DUKE), 18 May 1966, *D. E. Stone 2214, 2214A, 2214B, 2215* (DUKE), 29 May 1971, *D. E. Stone 3015* (DUKE). MEXICO. **Chiapas:** Selva Negra, 10 km from Rayón Mezcalpa along rd. to Jitotol, Mpio. Rayón, 1700 m, 10 Jan. 1981, *D. E. Breedlove & B. T. Keller 49290* (DUKE); 5 km SE of Jitotol, along rd. to Bochil, Mpio. Jitotol, 1600 m, 9 Jan. 1981, *D. E. Breedlove & B. T. Keller 49370* (DUKE), 10 Sep. 1981, *D. E. Breedlove & B. T. Keller 52670* (DUKE). **Veracruz:** Volcán Santa Marta, vertiente W, parte aguas, 1350 m, 16 Mar. 1968, *M. Sousa 3605* (DUKE), 1370 m, 16 Mar. 1968, *M. Sousa 3619* (DUKE).

Synonymy within *Alfaroa manningii*

I described *Alfaroa guanacastensis* D. E. Stone in 1977 as a segregate of *A. manningii* based on perceived differences in their respective leaf and nut morphology (short vs. long leaf petioles, low vs. pronounced ribs on the fruit husk, respectively) and geographic ranges (Pacific vs. Atlantic watershed in Costa Rica). Subsequent collections of these two taxa, as well as a more comprehensive overview of *Alfaroa* throughout Latin America, make a clear distinction between them untenable. It appears now that we are dealing with a series of disjunct populations that are characterized most notably by intergrading differences in sculpture pattern of the fruit husks. Consequently, *A. guanacastensis* is hereby reduced to synonymy under *A. manningii* (León, 1953).

Alfaroa manningii J. León, Ceiba 4(1): 44. 1953, as "*Manningii*." TYPE: Costa Rica. Cartago: Platanillo de Turrialba, 19 July 1951, *J. León 3469* (holotype, CATIE).

Alfaroa guanacastensis D. E. Stone, Fieldiana, Bot. 40: 40, fig. 7. 1977, syn. nov. TYPE: Costa Rica. Apr., *D. E. Stone 2167* (holotype, DUKE; isotypes, A, CR, F, US).

Relationship of *Alfaroa* and *Alfaropsis*

The genus *Alfaropsis* (Iljinskaya, 1993) is most commonly recognized as *Engelhardia roxburghiana* Wall. or *E. chrysolepis* Hance in the monotypic section Psilocarpeae Nagel emend. Leroy (Manning, 1966, 1978). It shares winged fruits with the Old World *Engelhardia* (Jacobs, 1960) and New World *Oreomunnea* (Manning, 1959). *Oreomunnea*, on the other hand, is the closest relative of *Alfaroa* (Manos & Stone, 2001), even though the latter has wingless, drupaceous fruits (Stone, 1977). There has been considerable conjecture as to the validity of recognizing *Oreomunnea* as a distinct genus and its status relative to *Alfaroa* (Manning, 1949; Stone, 1972), since they are virtually impossible to tell apart except for the distinctive pistillate flowers and fruits (Table 2). Support for recognition of Oersted's *Oreomunnea* (1856) was provided by Hjelmqvist (1948, 1960) and Leroy (1951) based on floral morphology, by Stone (1972) emphasizing the fruit and patterns of germination, and subsequently by Manchester (1987) incorporating the fossil history of the fruits. In 1990, Iljinskaya reviewed the taxonomy and phylogeny of the family and concluded, among other things, that *E. roxburghiana* should be treated as a species of *Alfaroa*, namely *A. roxburghiana* (Wall.) Iljinsk. While the evidence for this transfer is a bit confusing, due perhaps in part to our translation from Russian, she did make the case for recognizing this taxon as a link between *Engelhardia* sect. *Engelhardia* and the

←
williamsii (*Stone 3119*) with epidermal papillae surrounding the stomate. —H. *Alfaroa mexicana* (*Stone 2132*) with epidermal papillae surrounding the stomate. —I. *Alfaroa manningii* (*Stone 2220*) with epidermal papillae surrounding the stomate. Scale bars: A–C, E–I = 5.6 μm; D = 33 μm. (N.B. Fig. 3B in Manos & Stone [2001] displays the abaxial leaf surface of *Alfaroa hondurensis* L. O. Williams ex W. E. Manning, but this taxon has subsequently been reduced to synonomy under *A. guatemalensis* [see Stone, in press].)

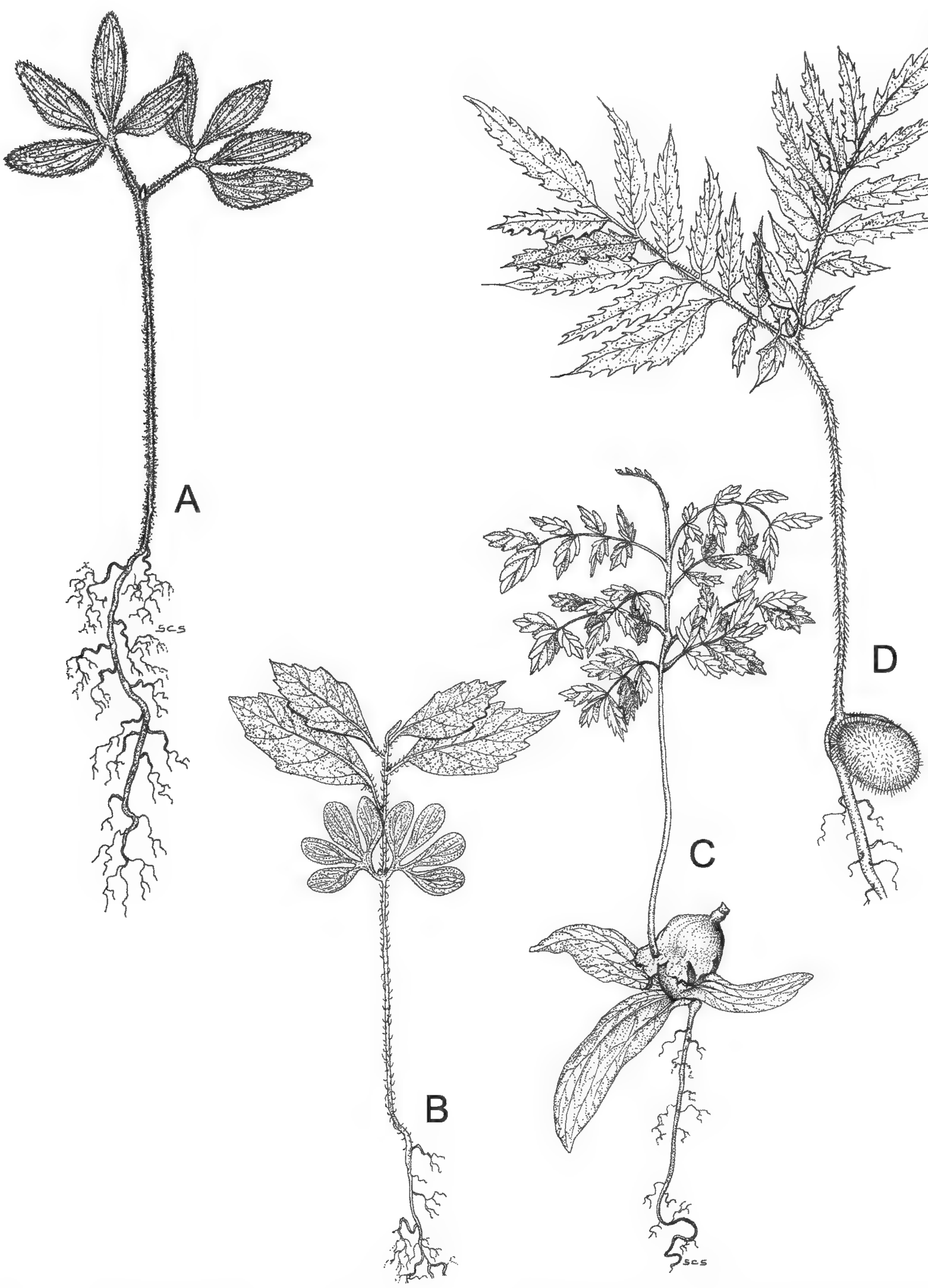

Figure 4. Seedlings of members of the Engelhardioideae. —A. *Engelhardia apoensis* Elmer ex Nagel (*FRI 1299*) with a pair of epigeous cotyledons, deeply bilobed, and each primary lobe further bifurcated (× 0.8). —B. *Alfaropsis roxburghiana* (*M. T. Kao s.n.*) with a pair of epigeous cotyledons similar to Figure 4A and a shoot with the first several leaves simple and alternate (× 0.8) (adapted from Conde & Stone, 1970). —C. *Oreomunnea mexicana* subsp. *mexicana* (*Stone 2142*) with hypogeous cotyledons embedded in a winged fruit and the shoot with opposite, compound leaves (× 0.9). —D. *Alfaroa costaricensis* subsp. *costaricensis* (*Stone 2156*) with hypogeous cotyledons embedded in a thin-skinned nut and shoot with opposite, compound leaves (× 0.5) (adapted from Conde & Stone, 1970).

Alfaroa–Oreomunnea clade (see Manos & Stone, 2001).

Similarities between *Alfaroa roxburghiana* and other members of *Alfaroa* that Iljinskaya contrasted to *Engelhardia* sect. *Engelhardia* include the evergreen habit, androgynous panicles borne terminally on new wood, pollen with a thick nexine, and carinal (split) oriented stigmas (Table 2). Iljinskaya (1993)

subsequently revisited the subject and assessed the characters *A. roxburghiana* shared with *Engelhardia* (e.g., lack of rhombic crystals in the leaf parenchyma, 3-winged fruiting bract that is pinnately veined, 4-chambered fruit, epigeal germination). Her conclusion this time was that *A. roxburghiana* was neither an *Alfaroa* nor *Engelhardia*, but rather deserved recognition at the generic level as *Alfaropsis*. A review of this newly described taxon was not undertaken until Manos and Stone (2001) provided molecular data (i.e., chloroplast DNA and the nuclear ribosomal ITS region) to confirm the distinctness of *Alfaropsis* and its placement as a sister to *Alfaroa–Oreomunnea*. They demurred, however, from formally recognizing *Alfaropsis*, citing the need for a broader sampling of *Engelhardia* species. Although additional molecular evidence has not been forthcoming to date, Manos et al. (2007: fig. 3) included *Alfaropsis* in their discussion of the phylogeny of extant and fossil Juglandaceae.

Whereas the preponderance of evidence would seem to favor recognition of *Alfaropsis* as a distinct clade, there are nevertheless some conspicuous morphological traits that link the genus very closely to the wing-fruited *Engelhardia* (Figs. 3, 4). Prominent here is the structure of the abaxial leaf epidermis that is smooth and undulating in all Old World taxa (Fig. 3A), but papillose in the New World, wing-fruited *Oreomunnea* (Fig. 3C–E) and the nut-fruited *Alfaroa* (Fig. 3F–I). Similarly, seed germination in the Old World *Engelhardia* (Fig. 4A) and *Alfaropsis* (Fig. 4B) is epigeal, whereas the New World *Oreomunnea* (Fig. 4C) and *Alfaroa* (Fig. 4D) have hypogeous cotyledons and hypogeal germination, despite their distinctive differences in the mode of dispersal, namely by wind in *Oreomunnea* and by animal in *Alfaroa* (Stone, 1973).

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Nomenclatural Novelties and Lectotypifications in Gymnomitriaceae

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Abstract. Anticipating the forthcoming first-ever published synthesis of the taxonomy, systematics, and nomenclature of the liverwort family Gymnomitriaceae H. Klinggr., where almost 800 names are treated in detail, we here provide 10 nomenclatural actions. Four new combinations are made: *Gymnomitrion bolivianum* (Steph.) Váňa, *G. minutulum* (Hässel) Váňa, *G. nigrum* (Grolle & Váňa) Váňa, and *G. subintegrum* (S. W. Arnell) Váňa. Lectotypification is presented for the following six names: *Acolea brevissima* Schleich. ex Dumort., *G. sinense* Müll. Frib., *G. verrucosum* W. E. Nicholson, *Jungermannia sphacelata* Giesecke ex Lindenb., *J. divaricata* Sm. var. *latifolia* Lindb. ex Norrl., and *Marsupella disticha* Steph.

Key words: Gymnomitriaceae, *Gymnomitrion*, *Marsupella*.

The liverwort family Gymnomitriaceae H. Klinggr. includes some 10 genera and over 70 accepted species. The authors are anticipating the publication of the first-ever synthesis of the taxonomy, systematics, and nomenclature of the family in 2010. Significantly, the treatment includes detailed taxonomy and nomenclature for almost 800 names associated with the family. It includes accepted names, synonyms, authorities, original citations, type data, a three-level coding system to indicate the level of knowledge about a taxon, as well as auxiliary data and annotations. Noteworthy remarks on various aspects of the distribution, ecology, conservation, and biology of members of the family are also included. When compiling the taxonomic and nomenclatural data for the synopsis of Gymnomitriaceae, the authors found that some taxa needed to be transferred or validated, and other taxa required lectotypification. Instead of embedding these critical nomenclatural novelties and lectotypifications in a larger paper that deals with over 800 names, we instead treat them here.

New Combinations

New combinations are required for the following names. All four taxa are treated as accepted taxa by the authors of the forthcoming treatment (Váňa et al., 2010) where full type details, citation, and synonymy are provided.

1. **Gymnomitrion bolivianum** (Steph.) Váňa, comb. nov. Basionym: *Anastrophyllum bolivianum* Steph., Biblioth. Bot. 87: 186. 1916. TYPE: Bolivia. Yanakaka Mtns., 4000 m, 1913, *T. Herzog 3832* (holotype, G 17213).

The older name, *Sphenolobus laceratus* Steph. (Stephani, 1902), is not available as it is blocked by *Gymnomitrion laceratum* (Steph.) Horik. (Horikawa, 1943).

2. **Gymnomitrion minutulum** (Hässel) Váňa, comb. nov. Basionym: *Marsupella minutula* Hässel, J. Bryol. 11: 123. 1980. TYPE: South Georgia. Bird Island, upper corrie of Roché Peak, ca. 275 m, 19 Dec. 1960, *S. W. Greene 435a* (holotype, AAS).

3. **Gymnomitrion nigrum** (Grolle & Váňa) Váňa, comb. nov. Basionym: *Marsupella nigra* Grolle & Váňa, J. Hattori Bot. Lab. 40: 186. 1976. TYPE: Papua New Guinea. Simbu: Mt. Wilhelm, below summit, 4400 m, 1968, *van Zanten 68-618/b* p.p. (holotype, JE; isotype, PRC). [Type specimen includes also *Marsupella subintegra* S. W. Arnell intermixed.]

4. **Gymnomitrion subintegrum** (S. W. Arnell) Váňa, comb. nov. Basionym: *Marsupella subintegra* S. W. Arnell, Ark. Bot., n.s. 3(16): 545. 1956. TYPE:

doi: 10.3417/2009082 Novon 20: 225–227. Published on 9 June 2010.

Uganda. Ruwenzori, Mijusi Valley, 4000 m, on steep rock facing W near the bottom of the valley, 30 Mar. 1948, *O. Hedberg 597* (holotype, UPS).

New Lectotypes

It is apparent that lectotypification is required for the following names.

1. Acolea brevissima Schleich. ex Dumort., Syll. Jungerm. Europ. 76. 1831. *Gymnomitrion brevissimum* (Schleich. ex Dumort.) Warnst., Hedwigia 53: 196. 1913. TYPE: Switzerland. Grand St-Bernard, "34. *J. concinnata* très petite Hooker, 20" in herb. Schleicher, [W. J.] *Hooker 20* (lectotype, designated here, LAU).

Dumortier (1831) based the species on *Jungermannia concinnata* β *minor* Schleich. Cat. exsicc. 1821 and cited it from "Habitat ad rupes in alpibus Helveticis." As a lectotype we chose the specimen from Schleicher's own herbarium. That specimen is annotated as isotype by R. Grolle, although he never selected a formal lectotype.

2. Gymnomitrion sinense Müll. Frib., Rev. Bryol. Lichénol. 20: 176. 1951. TYPE: China. Yunnan: sub jugo Dokerla, 4225 m, 18 Sep. 1915, *Handel-Mazzetti 8170*, det. *G. alpinum* (lectotype, designated here, S).

Müller (1951) mentioned only one specimen for the type, but there exist isotypes in at least JE, W, and WU. We select the lectotype from Müller's herbarium deposited in S. The isotypes in W and JE (duplicate from W) are mixed with *Apomarsupella revoluta* (Nees) R. M. Schust.

3. Gymnomitrion verrucosum W. E. Nicholson, Symb. Sin. 5: 10. 1930. *Marsupella verrucosa* (W. E. Nicholson) Grolle, Trans. Brit. Bryol. Soc. 5: 86. 1966. *Apomarsupella verrucosa* (W. E. Nicholson) Váňa, Bryobrothera 5: 227. 1999. TYPE: China. Yunnan: NW Yunnan, "beiderseits des Passes Tschiangschel, zwischen Salwin und Irrawadi," 3800–4050 m, 4 July 1916, *Handel-Mazzetti 9323* (lectotype, designated here, WU).

Nicholson (1930) mentioned only one specimen when describing the species. This specimen is deposited in Handel-Mazetti's herbarium in Vienna (WU).

4. Jungermannia sphacelata Giesecke ex Lindenb., Nova Acta Phys.-Med. Acad. Caes. Leop. Carol. Nat. Cur. 14(Suppl.): 76. 1829. *Marsupella sphacelata* (Giesecke ex Lindenb.) Dumort., Recueil Observ. Jungerm. 24. 1835. TYPE: Greenland. s.d., *Giesecke s.n.* (lectotype, designated here, W).

Lindenberg (1829) cited specimens (syntypes) from Greenland (leg. Gieseke) and Austria (leg. Wormskiold). As he described it referring to Gieseke, we select as a lectotype the specimen collected by Gieseke and deposited in Lindenberg's herbarium in W (isolectotype is in S).

5. Jungermannia divaricata Sm. var. **latifolia** Lindb. ex Norrl., Bot. Not. 1873: 145. 1873. TYPE: Finland. Lapponia enontekiensis, "Kilpisjärvitrakten," 1867, *Norrlin s.n.* (lectotype, designated here, H-SOL 2527003).

Norrlin (1873) cited only "Lindb. in sched." In Lindberg's herbarium in H, there are some specimens with the epithet "*latifolia*" labeled partly as *Cesia latifolia* Lindb., *Marsupella latifolia* Lindb., or *Nardia latifolia* Lindb. We select as a lectotype the specimen that both Norrlin and Lindberg should have seen. *Jungermannia divaricata* var. *latifolia* is a synonym of *M. boeckii* (Austin) Lindb. ex Kaal.

6. Marsupella disticha Steph., Bull. Herb. Boiss. ser. 2, 1: 164 [Spec. Hep. 2: 25]. 1901. TYPE: Japan. Honshū: Yamagata, sommet du Kattasan, 13 July 1894, *Faurie 14116* (lectotype, designated here, G 15035).

Stephani (1901) cited several collections, "Japonia in cacumine montis Kattasan (Faurie); insula Sado (Faurie); Sendai (Faurie)." The first mentioned specimen was selected as the type [should be lectotype] by Kitagawa (1963), without specifying the herbarium. Because duplicates of these collections exist (e.g., in the herbaria FH and PC), we select the specimen from Stephani's herbarium in G as the lectotype.

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Four New Species of *Ribes* (Grossulariaceae), Primarily from the Amotape–Huancabamba Zone in Northern Peru

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Abstract. Four new species of *Ribes* L. (Grossulariaceae) are described from Peru, three from the Amotape–Huancabamba Zone and one from the eastern slopes of the Andes in central Peru. *Ribes chachapoyense* Weigend & Breitkopf, *R. tumerec* Weigend & Breitkopf, and *R. huancabambense* Weigend & Breitkopf from the Amotape–Huancabamba Zone represent close allies of Ecuadorian species and underscore both the floristic connections of this region to Ecuador and its high levels of floristic distinctness and endemism. With these three new species, the species total for the Peruvian part of the Amotape–Huancabamba Zone now reaches 10, nearly half the species present in Peru. *Ribes frankei* Weigend & Breitkopf is possibly the most aberrant species of *Ribes*—it is a small, cushion-forming dwarf-shrub to 30 cm tall, with erect inflorescences that are virtually immersed in the leafy cushions. It is the smallest species of *Ribes* known so far and has been collected on vertical rock faces in the high Andes of Pasco in central Peru. The species total for Peruvian *Ribes* now reaches 23, which is nearly twice the number of species known for any other individual South American country, indicating that Peru, and especially the Amotape–Huancabamba Zone, represents the center of diversity of the genus in South America. Three of the newly described species are already at the brink of extinction due to habitat destruction (overgrazing, burning, mining, forest clearing: *R. tumerec*, *R. frankei*, *R. huancabambense*) and have to be considered as Critically Endangered. The fourth species, *R. chachapoyense*, has a slightly wider range and can be considered as only Endangered according to IUCN Red List criteria.

Key words: Amotape–Huancabamba Zone, Grossulariaceae, IUCN Red List, Peru, *Ribes*.

The genus *Ribes* L. (Grossulariaceae) comprises nearly 200 hermaphroditic and dioecious species in currently eight subgenera (Weigend, 2006), occurring mainly in the north-temperate zone (Janczewski, 1907; Weigend, 2003, 2006). Centers of diversity are found in southwestern North America and East Asia (Pojarkova, 1971; Lingdi & Alexander, 2001; Senters & Soltis, 2003; Schultheis & Donoghue, 2004). Only dioecious *Ribes* subg. *Parilla* Jancz. is present in South America (Janczewski, 1907) and extends into southern Central America with a single species, as has been recently shown (Weigend & Binder, 2002). Two sections are recognized in this subgenus: south-temperate section *Parilla* Jancz. and Andean section *Andina* Jancz. Section *Andina* is widespread from southern Central America to Bolivia and reaches Argentina with a single species (Weigend & Binder, 2001). *Ribes* subg. *Parilla* sect. *Andina* consists of functionally dioecious species, with morphological differentiation between the different sexes not obvious. Female flowers tend to be marginally smaller and have well-developed anthers without, however, producing viable pollen. Conversely, male flowers appear fully bisexual at first glance, but the ovules fail to develop (Janczewski, 1907; Weigend et al., 2002). In the field, fruit formation or lack thereof are the only clear indicators of gender in this group.

Numerous new species of *Ribes* subg. *Parilla* sect. *Andina* have been described in recent years, mainly from Ecuador (Freire-Fierro, 1998, 2002, 2004; Weigend & Binder, 2002), but also from Peru (Weigend et al., 2005b; Weigend, 2006). All of the recently described species of *Ribes* from Peru and some of those from Ecuador were discovered in the Amotape–Huancabamba Zone, an area of extraordinary species richness and high levels of endemism (Duellman, 1979; Berry, 1982; Young & Reynel, 1997; Ayers, 1999; Skrabal et al., 2001; Weigend, 2002, 2004a, b; Weigend et al., 2005a; De Witt Smith & Baum, 2006). Notably, the species described from Peru belong to two species groups previously only

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known from Ecuador (or extending farther north from Ecuador). Several species described are closely allied to *R. andicola* Jancz. (ranging north to Colombia and Venezuela), namely *R. sanchezii* Weigend, *R. colandina* Weigend, and *R. contumazensis* Weigend (Weigend et al., 2005b). *Ribes erectum* Freire-Fierro and *R. nanophyllum* Freire-Fierro & Endara have been described relatively recently from Ecuador (Freire-Fierro, 1998, 2002, 2004). The latter two species represent a highly characteristic group within Andean *Ribes*, since they have virtually undivided, evergreen, coriaceous leaves and long, stiffly erect inflorescences. Weigend and Rodríguez (2006) described a third species of this group, *R. amazonicum* Weigend & E. Rodr., from the Amotape–Huancabamba Zone in northern Peru.

Several new collections from this area have been made in recent years. A comparison to both published data (Freire-Fierro, 2004; Weigend et al., 2005b; Weigend & Rodríguez, 2006) and herbarium specimens shows that these collections include four new species of *Ribes* from the Amotape–Huancabamba Zone (Fig. 1), which are described here. The new taxa are clearly differentiated on the basis of leaf and flower morphology and indument. Three of them (*R. huancabambense* Weigend & Breitkopf, *R. chachapoyense* Weigend & Breitkopf, *R. tumerec* Weigend & Breitkopf) are closely allied to three different Ecuadorian species groups (see below).

The fourth species described here comes from the upper eastern slopes of the Andes in the department of Pasco, one of the least known areas of Peru. All roads crossing from the Andes into Amazonia usually follow the deeply cut river valleys, so that the higher regions are virtually inaccessible in most places. *Ribes frankei* Weigend & Breitkopf is easily the most aberrant species of *Ribes* described so far. It is a small, cushion-forming shrublet found in rock faces and thus represents the smallest species known for the genus.

The newly described *Ribes* species bring the species total for the Peruvian part of the Amotape–Huancabamba Zone up to 10 species of 23 species now known for Peru. This means that nearly half the species of the genus are concentrated in this relatively small part of Andean Peru, underscoring the high levels of diversity and endemism found in other studies (Berry, 1982; Ayers, 1999; Skrabal et al., 2001; Weigend, 2002, 2004a, b; Weigend et al., 2005a). The overall species number known from the Amotape–Huancabamba Zone is now higher than the total number of species reported from Ecuador (nine species; Freire-Fierro, 2004), Colombia (seven species; M. Weigend, pers. obs.), or Bolivia (seven species; Weigend & Binder, 2001) and nearly as high as the number reported for Argentina and Chile together (13 species; Weigend, 2008). Peru has more than twice as many species of *Ribes* overall as any other single South American country. Also, the presence of new species of groups previously known from Ecuador underscores the mixture of North Andean and Central Andean floristic elements in the Amotape–Huancabamba Zone (Weigend, 2002).

Taxonomic Treatment

1. **Ribes chachapoyense** Weigend & Breitkopf, sp. nov. TYPE: Peru. Amazonas: Chachapoyas, Leymebamba, path to Laguna de los Cóndores, Pampa Muralla, 3800 m, 17 May 2004, *C. Schwarzer 06* (holotype, USM; isotype, B). Figures 1, 2.

Haec species *Ribi hirto* Humb. & Bonpl. ex Roem. & Schult. ut videtur affinis, sed ab eo foliis dissitis multo majoribus lamina manifeste profundeque triloba atque inflorescentia longiore pluriflora distinguitur.

Shrub, erect or lianescent, to 1–3 m tall; branches 3–40 cm, bark brown or red-brown in the first year and covered with scattered stipitate glands, later dark brown or bright gray, largely glabrous and eglandular, weakly exfoliating later. Bud scales (cataphylls) ovate to oblong, apex acuminate, 10–25 × 4–7 mm, numerous sessile to minute stipitate glands especially in distal portion, puberulent, pubescent stipitate glands present on margin. Leaves probably deciduous, pale to dark green; petiole 1–5 cm, ca. 1/3 to equaling the lamina length, slightly dilated in stipular region, densely short pubescent, with pubescent stipitate glands (to 5 mm); lamina triangular-ovate, with largest leaves to 80 × 90 mm, lobed with 1 lobe on each side, sometimes obscurely 5-lobed, median lobe to 20–55 × 15–50 mm, margins serrate, with scattered stipitate glands, leaf base cordate, both surfaces subglabrous, pubescent, or rarely with scattered stipitate glands ca. 1 mm long. Plants dioecious; inflorescences terminal racemes, erect, later pendulous, with (15 to)40(to 70) flowers, to 25 cm long in flower; peduncles 0.5–4 cm, densely pubescent to 1 mm, scattered to numerous stipitate glands with or without white hairs on stem; pedicels 4–5(–8) mm; bracts ovate to oblong, apex acuminate, 4–10 × 1.5–3 mm, pale orange to reddish orange with darker center, numerous long stipitate glands on margin, often pubescent; bracteoles similar, 2–3 × 1–1.5 mm. Flowers narrowly campanulate, 6–7 × 4–6 mm, red to purple; hypanthium 4–5 mm, base (ovarian portion) with numerous stipitate glands, glabrous to densely pubescent; calyx lobes 2–2.5 mm, eglandular or with scattered stipitate glands; petals obovate, apex acuminate, ca. 1 × 1 mm, glabrous; filaments and anthers each ca. 1.5 mm. Fruit a red berry, glabrous or covered with

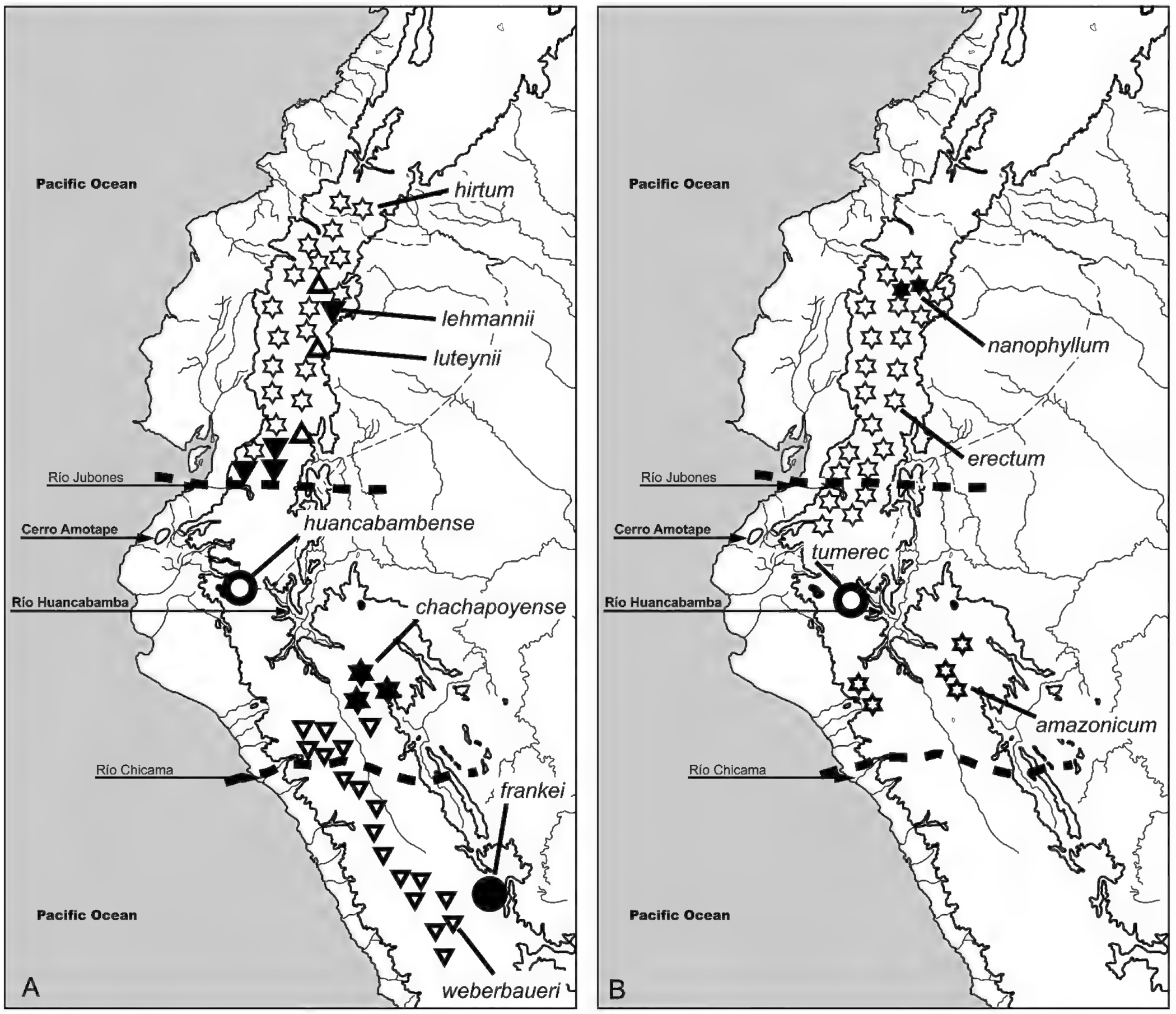

Figure 1. Distribution maps of the *Ribes hirtum* and *R. erectum* groups in southern Colombia, Ecuador, and northern Peru (Freire-Fierro, 2004; Weigend & Rodríguez, 2006; Weigend, pers. obs.). —A. *Ribes hirtum* group. —B. *Ribes erectum* group; the westernmost collections of *R. amazonicum* in Peru are new (Cajamarca, Santa Cruz, Pulán, *I. Vela & L. Dávila-E 603* [CPUN]; Lambayeque, Ferreñafe, Ullurpampa, *M. Weigend et al. 8554* [B, USM]).

numerous stipitate glands, or pubescent, seeds ca. 2 × 1.5 mm.

Distribution and habitat. *Ribes chachapoyense* is apparently relatively abundant in a rather narrow region of the neighboring provinces of Chachapoyas and Bolívar in Peru. It is found at the upper margins of the cloud forest belt, essentially in subpáramo vegetation. The collections are from a relatively narrow region—the species is restricted to the upper eastern slopes of the Cordillera Central (the easternmost mountain range in this area) and is replaced by *R. weberbaueri* Jancz. and *R. colandina* on the western slope of this mountain range. It has been collected at elevations of 3250–3600 m.

IUCN Red List category. *Ribes chachapoyense* is the only relatively abundant species of the four new species described here. It is assessed here as Endangered (EN B1ab; C1) according to IUCN Red List criteria (IUCN, 2001) because only four populations are known and these contain well below 50 mature individuals (< 2500 individuals total). Moreover, the total area of occupancy is less than 500 km^2, severely fragmented, and subject to massive habitat destruction (overgrazing and burning).

Phenology. There are flowering collections from May, June, August, and November, and it can be assumed that the species flowers and fruits more or less throughout the year.

Etymology. The specific epithet refers to the distribution of the new species in the Peruvian province of Chachapoyas and neighboring areas.

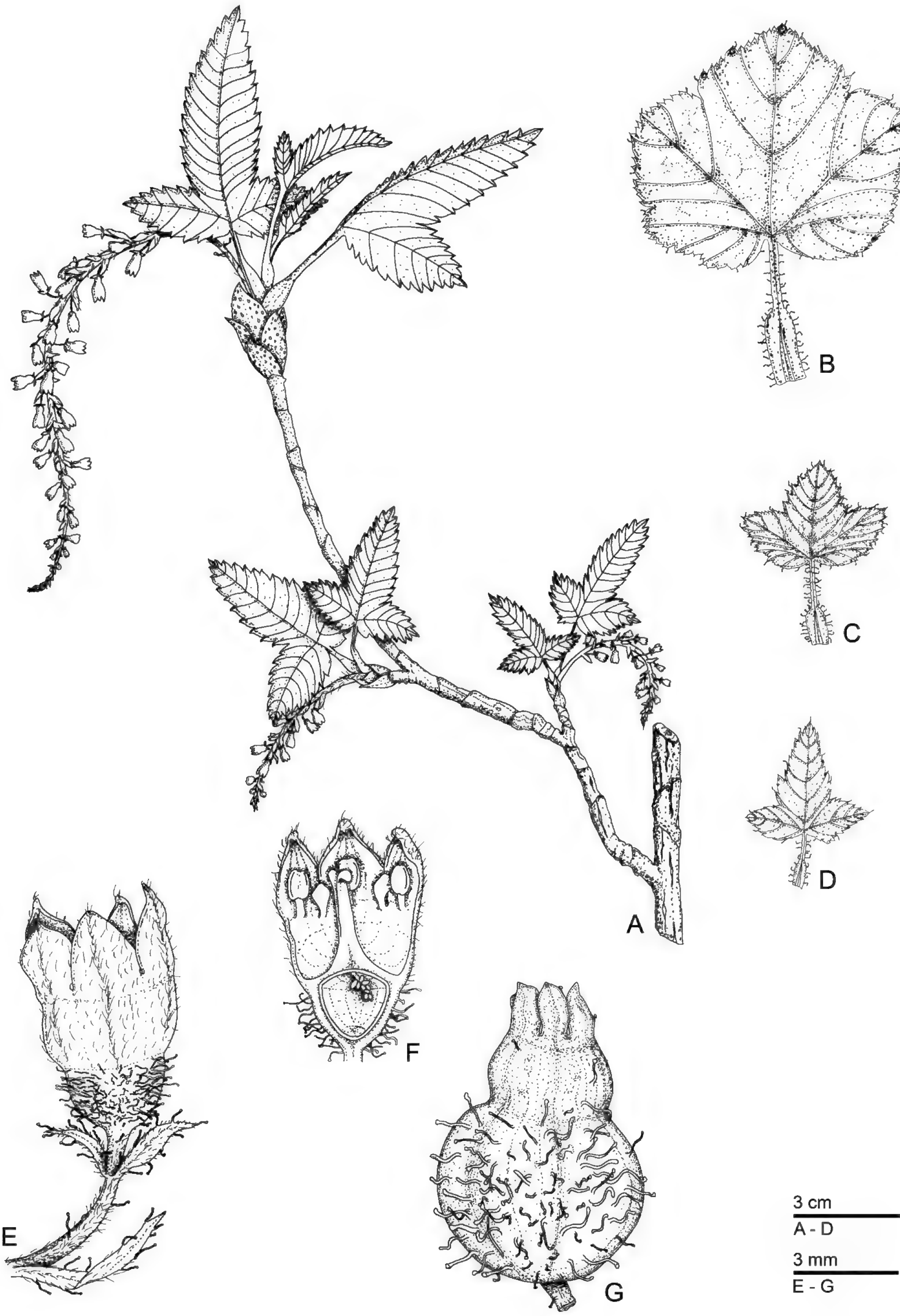

Figure 2. *Ribes chachapoyense* Weigend & Breitkopf. —A. Flowering branch. —B–D. Leaves. —E, F. Flowers. —G. Fruit. Drawings by H. Breitkopf. A, drawn from the paratype *Sanchez et al. 11186* (CPUN); B, G, from the paratype *Henning & Schneider 293* (B); C, from the paratype *Quipuscoa et al. 1203* (HUT); D–F, from the paratype *Hofreiter 2004/1* (B).

Relationships. The new species is evidently allied to Ecuadorian *Ribes hirtum* Humb. & Bonpl. ex Roem. & Schult., but differs in the more widely spaced and much larger leaves (at least twice as large as *R. hirtum*), the lamina that is clearly and deeply 3-lobed (vs. obscurely lobed to deeply lobulate-serrate in *R. hirtum*), and the inflorescences that are longer and have more flowers. *Ribes chachapoyense* is

morphologically intermediate between the *R. macrobotrys* Ruiz & Pav. group, which has larger, deeply lobed leaves, very long inflorescences (to 35 cm long), and an often lianescent habit (Weigend & Binder, 2001), and the *R. hirtum* group, with small, weakly lobed leaves, shorter inflorescences (usually less than 15 cm long), and consisting of usually stiffly erect, sparsely branched shrublets. *Ribes weberbaueri*, a species with very similar flowers that also belongs in the *R. hirtum* group, replaces *R. chachapoyense* to the southwest in Cajamarca, La Libertad, and Ancash, but differs in a very densely branched habit, much smaller (ca. 3–5 cm long) and deeply dissected leaves, and much shorter inflorescences (< 5 cm long).

Paratypes. PERU. **Amazonas:** Way from Leymebamba to Laguna de los Cóndores, 06°49.25′S, 077°44′W, 25 May 2001, *T. Henning & C. Schneider 293* (B, HUT, M, USM); Leymebamba, ruta Laguna de los Cóndores, entre Pampa Hermosa y La Muralla, 06°49.05′S, 077°44.08′W, 3250–3500 m, 15 Aug. 1998, *V. Quipuscoa S., A. Sagástegui A., S. Leiva G. & M. Bejarano C. 1203* (HUT). **La Libertad:** Bolívar, E of Bolívar, upper slopes of E side of cordillera toward Amazonia, Sep. 2004, *Hofreiter 2004/1* (B, M, USM); Ascenso a Nevado de Cajamarquilla, 07°08′S, W 077°42′W, 10 Nov. 2001, *I. Sánchez V., M. Dillon & G. Iberico 11186* (B, CPUN).

2. Ribes frankei Weigend & Breitkopf, sp. nov. TYPE: Peru. Pasco: Huachón, Nevado de Huagaruncho, 4500 m, 23 Nov. 1999, *T. Hofreiter & T. Franke 1/107* (holotype, USM; isotypes, B, HUT). Figures 1, 3.

Haec species quoad foliorum florumque formam *Ribi luteynii* Weigand simillima, sed ab eo inflorescentia breviore erecta, ab omnibus congeneris habitu suffruticoso pulviniformi perclare distinguitur.

Dwarf shrub 0.1–0.3 m tall, densely branching; bark red-brown, glandular by numerous minute stipitate glands, scattered white hairs < 0.5 mm; bud scales unknown. Leaves coriaceous, dark green; petiole 7–8 mm, ca. 1/3 to equaling the lamina length; stipular region dilated, 3–4 mm wide, pubescent from white hairs < 1 mm, densely set with numerous minute stipitate glands on the adaxial surface and long stipitate glands with hairs on petiole on the margin, largest stipitate glands branching, with 2 to 5 glandular tips; lamina obovate to elliptic, margins reflexed, (6–)14(–17) × (3–)6(–8) mm on flowering shoots, to 20 × 15 mm on vegetative shoots, with 1 small lateral lobe on each side, median lobe up to 4 × 4 mm, with 2 to 4 serrations, incisions between lobes 1–1.5 mm deep, margins sparsely serrate only in the distal half of lamina, leaf base cuneate, rarely obtuse, adaxial surface shortly pubescent, < 0.5 mm, with numerous minute stipitate glands, abaxial surface pubescent with white hairs to 1 mm, with numerous minute stipitate glands. Plants dioecious; inflorescences terminal racemes, subsessile, erect, very dense, ca. 3 cm long, with (5 to)10(to 15) flowers; pedicels 1–2 mm; bracts ovate to oblong, apex acute, 6–9 × 2–3 mm; bracteoles similar, ca. 2 × 0.8 mm, bracts and bracteoles bright green, with numerous long stipitate glands on margins and scattered minute stipitate glands on the abaxial surface. Flowers campanulate, 9–11 × 7–9 mm, wine-red on the outside, orange on the inside (senescent flowers yellow); hypanthium 6–7 mm, pubescent, with scattered long stipitate glands; ovarian portion 1/2 as long as the hypanthium, lobes ca. 2.5 × 3 mm; petals ca. 2.5 × 0.8 mm, apex obtuse, style apex bifid; filaments 2–2.5 mm, anthers ca. 1 mm. Fruit unknown.

Distribution and habitat. *Ribes frankei* was found on near-vertical rock in crevices and on rock ledges. The new species is currently known only from a single locality in Huachón, Peru, but the entire region is still floristically very poorly known.

IUCN Red List category. *Ribes frankei* is known only from the type collection. The high-Andean habitat where it grows is frequently burnt for improving the pastures and the area is overgrazed, with *Ribes* subject to heavy browsing by cattle. While the existence of additional populations cannot be ruled out, at present it has to be considered as Critically Endangered (CR B1ab) according to IUCN Red List criteria (extent of occurrence < 10 km^2, known from a single location, population size < 250 individuals; IUCN, 2001).

Phenology. The type collection is from October, which is the peak flowering season for Peruvian *Ribes* and probably the typical flowering time of this species. Fruits likely mature from January to March.

Etymology. The specific epithet honors Thassilo Franke (Munich, 1972–), who collected the type and has contributed many interesting collections to our research.

Relationships. *Ribes frankei* is easily the most distinctive species of *Ribes*, and its cushion-forming habit makes it unique in the genus. In flower and leaf morphology it shows some resemblance to the group around *R. hirtum* (see above under *R. chachapoyense*), but it is readily differentiated from these in its cushion-forming habit and short, erect inflorescences. Flower and leaf morphology most closely resembles *R. luteynii* Weigend, which differs clearly in habit (sparsely branched shrub to 1.5 m tall), inflorescence

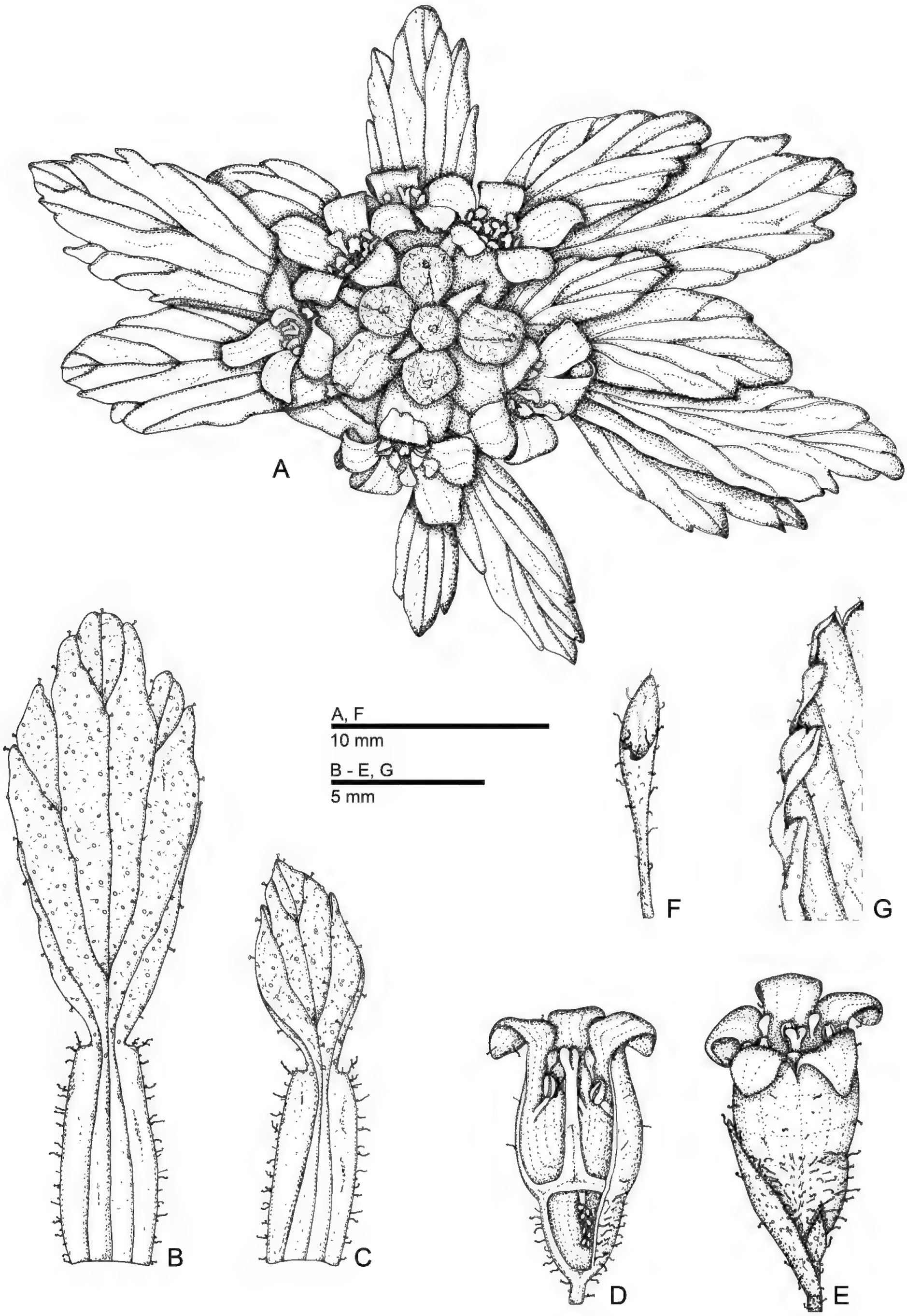

Figure 3. *Ribes frankei* Weigend & Breitkopf. —A. Habit (top view). —B. Aberrant bracteole. —C. Leaf margin, abaxial side. —D, E. Flowers. —F, G. Leaves. Drawings by H. Breitkopf; drawn from the isotype *Hofreiter & Franke 1/107* (B).

size (up to 8.5 cm), and inflorescence orientation (pendulous). Other species of Peruvian *Ribes* are sometimes found growing in vertical rock faces (*R. cuneifolium* Ruiz & Pav., *R. brachybotrys* (Wedd.) Jancz.), but these are normally developed shrubs. *Ribes frankei* is the only cushion-forming species specifically adapted to this habitat by the formation of tough, flat mats.

3. Ribes huancabambense Weigend & Breitkopf, sp. nov. TYPE: Peru. Piura: Huancabamba, Carmen de la Frontera, localidad de Rosarios Bajos, 3280–3555 m, 27 July 2006, *A. Cano, W. Mendoza & N. Valencia 16776* (holotype, USM; isotype, B). Figures 1, 4.

Haec species quoad habitum unicaulem supra tantum ramosum, ramos foliis coriaceis ad extremum aggregatis plerumque in racemum densum primo erectum deinde pendulum desinentes atque florem extus rubrum intus aurantiacum *Ribi hirto* Humb. & Bonpl. ex Roem. & Schult., *R. luteynii* Weigand et *R. lehmannii* Jancz. similis, sed a his duobus foliis minoribus suborbicularibus profunde trilobis, ab illo foliis supra glabratis subtus secus venas tantum parce glandularibus pubescentibusque, inflorescentia multo breviore pauciflora atque floribus minoribus distinguitur.

Shrub or treelet, stiffly erect, 0.6–1 m tall, sparsely branched only above, flowering branches 4–20 cm long; bark brown in the first year, densely pubescent with short trichomes, glandular with numerous stipitate glands, later dark brown or bright gray, weakly exfoliating. Bud scales (= cataphylls) ovate, apex acuminate, 3.5–5 × 2.5–3 mm, numerous white hairs and stipitate glands with hairs on stem present on margin and distal portion. Leaves probably evergreen, coriaceous, dark green; petiole 4–6 mm, ca. 1/3 to 1/2 of lamina length, stipular region ca. 3–4 × 2–2.5 mm, apices of stipules barely differentiated, numerous stipitate glands with hairs on stem, densely pubescent with trichomes to 1 mm long; lamina triangular-ovate, (6–)10(–12) × (6–)10(–15) mm, trilobed with 1 lobe on each side, rarely obscurely 5-lobed, median lobe to 6 × 8 mm, margins sparsely serrate, with 2 to 6 serrations per lobe, with scattered stipitate glands especially on the tips of the lobules, entire, leaf base subcordate to subcuneate, adaxial surface glabrous, but with scattered stipitate glands near margin, abaxial surface subglabrous, very few white hairs on the pilose margin, scattered stipitate glands especially on veins. Plants dioecious; inflorescences terminal, erect, later pendent racemes to 4 cm, with 7 to 10(to 15) flowers; peduncles 9–15 mm, densely pubescent with white hairs to 1 mm, with numerous stipitate glands, sometimes with hairs on stem; pedicels 2–3.5 mm; bracts ovate to oblong, apex acuminate, 3–5 × 1.5–2 mm, pale with darker center, numerous long stipitate glands especially on margin and distal 1/3, proximal bracts often with green tips; bracteoles similar, 1–1.5 × 0.5–0.7 mm. Flowers narrowly campanulate, 4–6 × 2.5–4 mm, wine-red on the outside, orange on the inside; hypanthium ca. 4 mm, base (ovarian portion) with numerous stipitate glands, scattered to numerous white hairs; calyx lobes ca. 1.5–2 mm, with scattered stipitate glands, densely pubescent with white hairs; petals ovate to oblong, apex acuminate to emarginate, mostly obtuse, ca. 1 × 0.5 mm, glabrous, style apically bifid; filaments and anthers each ca. 1.5 mm. Mature fruit unknown.

Distribution and habitat. *Ribes huancabambense* is found in more or less open subpáramo vegetation. The new taxon is currently known only from a single locality in Huancabamba, Peru, but the entire region is still very poorly known.

IUCN Red List category. *Ribes huancabambense* is known only from the type collection. The subpáramo vegetation is gradually being destroyed by burning, overgrazing, and increasingly aggressive mining operations in the area. Additional populations may be present, but at present the species has to be considered as Critically Endangered (CR B1ab) according to IUCN Red List criteria (extent of occurrence < 10 km^2, known from a single location, population size < 250 individuals, area subject to dramatic habitat destruction; IUCN, 2001).

Phenology. The type collection is from July, but the species possibly flowers and fruits throughout the year in this permanently moist habitat.

Etymology. The specific epithet is derived from Huancabamba, the name of the Peruvian province where the type collection came from.

Relationships. *Ribes huancabambense* is morphologically close to the Ecuadorian species *R. hirtum*, *R. luteynii*, and *R. lehmannii* Jancz., which it resembles in overall morphology. The four species share a fairly unique habit: they are small, more or less single-stemmed shrublets (treelets) that are branched only above. The coriaceous leaves are tufted at the end of the branches, which typically terminate in a dense, initially erect, later pendulous raceme. The flowers are red on the outside and orange on the inside. The species differ clearly in details of the indument and leaf morphology: *R. huancabambense* has very small, subcircular, deeply 3-lobed leaves and smaller flowers. Conversely, the leaves of *R. luteynii* and *R. lehmannii* are narrowly (ob)ovate and long acuminate, without any clear lateral lobes. *Ribes hirtum* has a similar leaf shape, but the leaves are densely pubescent and glandular on both surfaces, whereas those of *R. huancabambense* are glabrate adaxially and only sparsely glandular and pubescent on the veins abaxially. Also, the inflorescences are much shorter in *R. huancabambense* (< 4 cm vs. up to 15 cm in *R. hirtum*) and there are fewer and smaller flowers in the inflorescence (seven to 15 flowers < 4 mm long

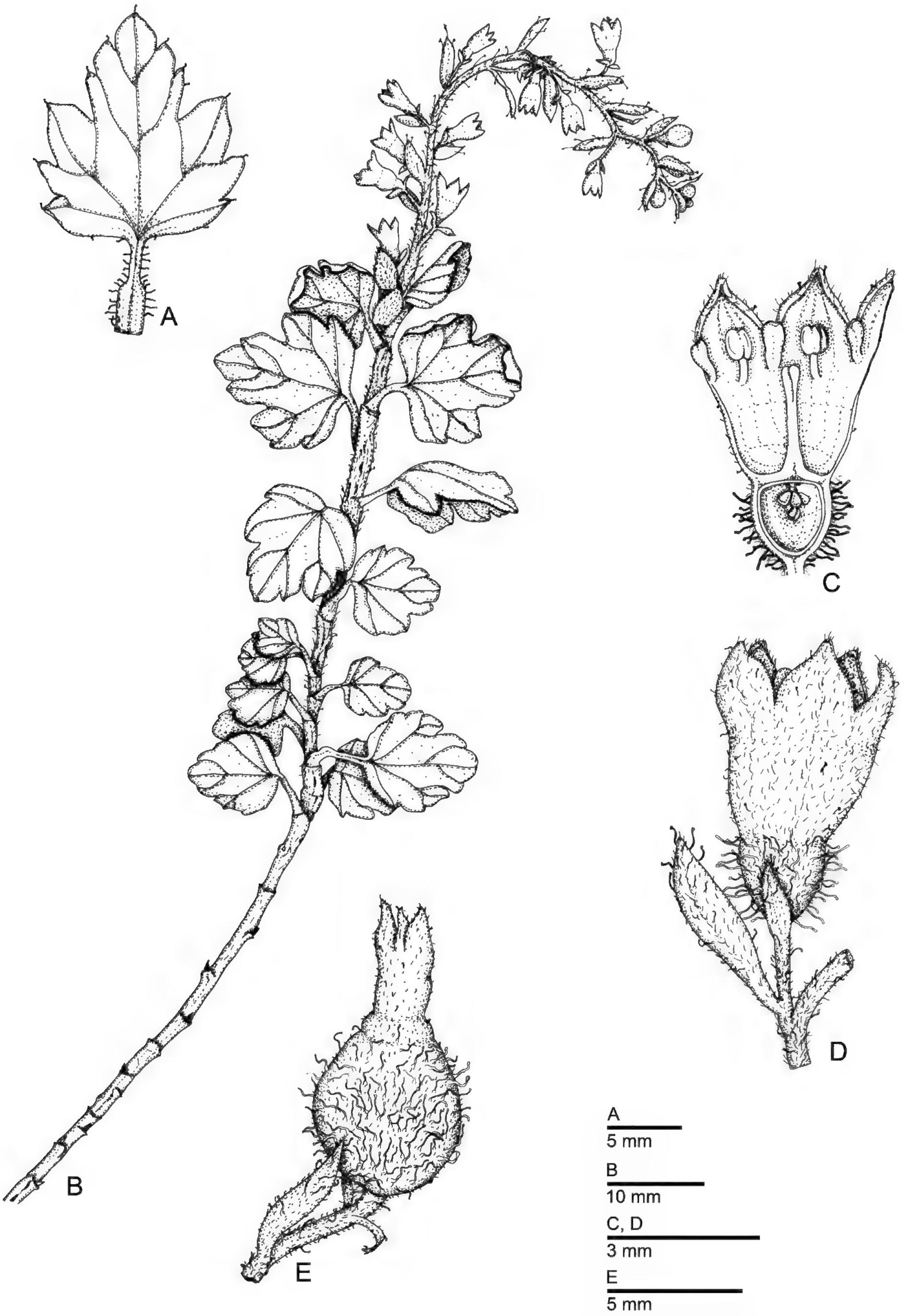

Figure 4. *Ribes huancabambense* Weigend & Breitkopf. —A. Leaf. —B. Flowering branch. —C, D. Flowers. —E. Fruit. Drawings by H. Breitkopf; drawn from the isotype *Cano et al. 16776* (B).

vs. 25 to 40 flowers ca. 7–8 mm in *R. hirtum*). *Ribes weberbaueri*, from the same species complex, differs from all these species by its deeply and repeatedly dissected leaves.

4. **Ribes tumerec** Weigend & Breitkopf, sp. nov. TYPE: Peru. Cajamarca: Jaén, Sallique, localidad de Lanchal, La Cocha, 05°40.52′S, 079°14.5′W, 3300 m, 28 June 1998, *C. Diaz*,

J. Campos, T. Guevara & E. Tineo 9724 (holotype, HUT; isotype, B). Figures 1, 5.

Haec species congeneris sempervirentibus inflorescentiis erectis praeditis nuper descriptis (*Ribi erecto* Freire-Fierro, *R. nanophyllo* Freire-Fierro & Endara et *R. amazonico* Weigend & E. Rodr.) ut videtur arcte affinis, sed ab eis caulibus foliis inflorescentia ovario sepalisque densissime stipitato-glandulosis distinguitur.

Shrub erect or subscandent, 1–4 m tall, moderately branching, flowering branches 10–40 cm long; bark brown, glabrous but with numerous stipitate glands, weakly exfoliating later; bud scales (cataphylls) ovate to oblong, apex acuminate, 4–6 × 2–3 mm, numerous stipitate glands on margin, otherwise glabrous. Leaves evergreen, coriaceous, dark green; petiole 10–20 mm, ca. 1/4 to 1/3 of lamina length; stipular region ca. 1/2 of petiole length, 7–9 × 3–4 mm, abruptly dilated, free apices of stipules missing, densely pubescent, with numerous stipitate glands especially on the margin of the stipulate region; lamina triangular-ovate, (25–)30(–40) × (15–)19(–25) mm, trilobed, lateral lobes much smaller than median lobe, median lobe 10–22 × 9–15 mm, margin simply serrate apart from proximal portion (ca. 15% of overall length), base cuneate (ca. 90°), abaxial and adaxial surfaces glabrous, but with scattered stipitate glands, especially on lobules. Plants dioecious; inflorescences terminal racemes, erect, with (20 to)25(to 40) flowers, (10–)15(–20) cm long in flower; peduncles 1.5–2.5 cm, densely pubescent, with numerous stipitate glands; pedicels 2–3 mm; bracts ovate to elliptical, apex acuminate, 5–7 × 1.5–2 mm, pale brown, darker in the middle, with very few short hairs and numerous long stipitate glands on margin; bracteoles similar, 1–2 × 0.4–0.7 mm. Flowers narrowly campanulate, 4–6 × 3–5 mm, wine-red; hypanthium 2.5–4 mm, base (ovarian portion) with numerous stipitate glands and scattered white trichomes; calyx lobes 1.5–2 mm, with numerous stipitate glands and scattered white trichomes abaxially; petals ovate, apex acuminate, 0.7–1 × 0.4–0.6 mm, with a hood-shaped, introrse protuberance in the proximal half, glabrous; stamens with filaments and anthers each ca. 0.7 mm, nectaria large, lining the proximal half of the hypanthium to the level of the insertion of filaments and petals. Fruit a red berry, covered with numerous stipitate glands and scattered white trichomes, calyx remnants ca. 1/3 to 1/2 of entire portion, seeds ca. 2 × 1.5 mm.

Distribution and habitat. *Ribes tumerec* is found in the undergrowth of cloud forest remnants. The new species is currently known only from a single locality in Jaén, Peru, but the entire region is still very poorly known.

IUCN Red List category. *Ribes tumerec*, like *R. amazonicum*, is a species of the undergrowth of cloud forests and is rapidly eliminated from cleared areas. Its current habitat represents the last stands of moderately well-preserved cloud forests in the area and will likely be destroyed in the near future. The species has to be considered as Critically Endangered (CR A2; B1ab) according to IUCN Red List criteria (IUCN, 2001), because it has likely lost more than 80% of its range in the last three generations due to habitat destruction, its known range is less than 100 km², and it is only known from a single location with a population size of less than 250 individuals.

Phenology. The type collection is from June, but the species likely flowers and fruits throughout the year in this permanently moist habitat. This phenology is also known for the closely related *Ribes amazonicum* (Weigend & Rodríguez, 2006).

Etymology. The specific epithet is an anagram of the word "erectum," and *Ribes erectum* is a closely allied Ecuadorian species. The epithet is to be treated as a noun in apposition (McNeill et al., 2006: Art. 23.1).

Relationships. *Ribes tumerec* is evidently closely allied to other recently described evergreen species of *Ribes* with erect inflorescences (*R. erectum* and *R. nanophyllum* from Ecuador [Freire Fierro, 1998, 2002, respectively], *R. amazonicum* from Peru [Weigend & Rodríguez, 2006]). However, *R. tumerec* differs from all other species of this group by its very dense cover of stipitate glands on the rachis, ovary, sepals, leaves, and stems. *Ribes erectum* is covered with subsessile glands only on the ovary and is otherwise largely eglandular, but is densely covered with simple, white trichomes on the rachis and flower. *Ribes amazonicum*, the only Peruvian species previously known from that group, differs in the possession of very few stipitate glands mixed with numerous simple hairs on the inflorescence, flowers, and fruits. Both *R. amazonicum* and *R. tumerec* differ from the two Ecuadorian species by the possession of triangular-ovate leaves with very well-developed lateral lobes. These lateral leaf lobes are barely differentiated in *R. nanophyllum* and *R. erectum*.

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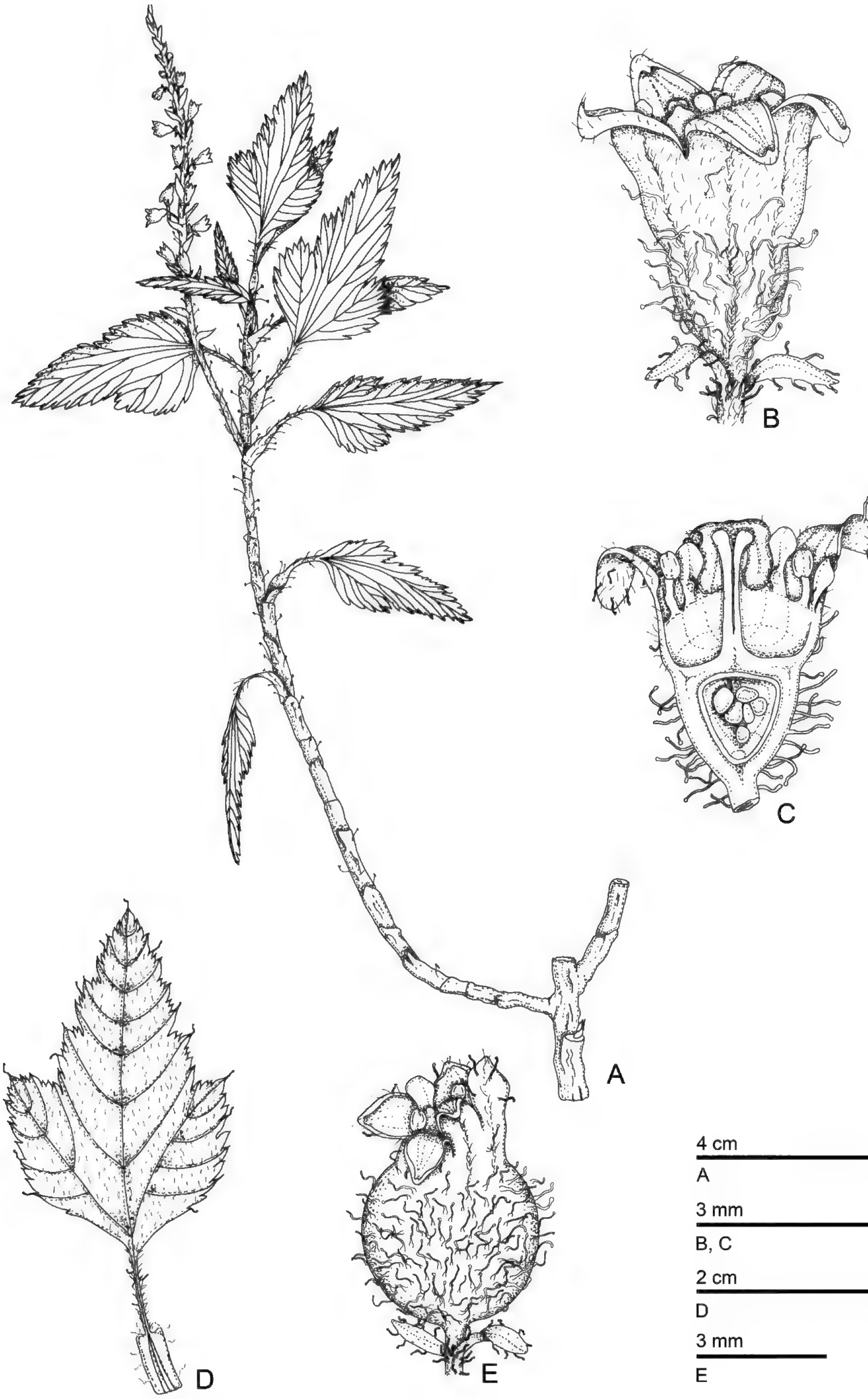

Figure 5. *Ribes tumerec* Weigend & Breitkopf. —A. Flowering branch. —B, C. Flowers. —D. Leaf. —E. Fruit. Drawings by H. Breitkopf; drawn from the isotype *Diaz et al. 9724* (B).

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Fagopyrum pugense (Polygonaceae), a New Species from Sichuan, China

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ABSTRACT. *Fagopyrum pugense* T. Yu (Polygonaceae, Polygonoideae), known only from Luojishan, Puge County, Sichuan Province, China, is described and illustrated. It is closely related to *F. gracilipes* (Hemsl.) Dammer ex Diels, but differs in the plants having thicker stems and branches with densely erect-villose pubescence, numerous nodes and short internodes, ovate to cordate leaves that are minutely rugose with small pustules, and small achenes. The karyotype studies were also conducted, and the results are presented.

Key words: China, *Fagopyrum*, IUCN Red List, karyology, Polygonaceae.

The Old World genus *Fagopyrum* Mill. (Polygonaceae) is most diverse in China, where 10 of its 16 species are found (Li, 1998; Ohnishi, 1998). In August 2003, while investigating sources of wild-type buckwheat germplasm in the town of Luojishan, Puge County, Sichuan Province, China, we found a new wild-type buckwheat species that is described here based on gross morphology and karyology.

MATERIALS AND METHODS

Specimens of a new buckwheat were obtained in July 2006 and cultivated at Sichuan Agricultural University, China. The taxa and collection information are provided in Table 1. Ripe seeds were air dried, and selected seeds were soaked in distilled water in petri dishes for several hours and allowed to germinate at a constant temperature (25°C) for 24 hours until the root tips were 1–2 cm long. Primary roots were pretreated in ice water for 27 hours, fixed for 24 hours in 3:1 glacial acetic acid:ethanol, then washed with distilled water and hydrolyzed in 1 mol/L HCl at laboratory temperature for 8–15 min. Root tips were squashed and stained in phenol rosaniline. Five well-scattered metaphase plates of each of the six taxa listed in Table 1 were selected for karyotype analysis. An average of karyotypes was calculated using the method described by Li and Chen (1985); karyotype classification was determined using the method of Stebbins (1971).

TAXONOMIC RESULTS

Fagopyrum pugense T. Yu, sp. nov. TYPE: China. Sichuan: Liangshan, Puge Co., LuoJishan, in thick growth of grass on slopes, 1190 m, 16 Sep. 2006, *T. Yu Ghassot 4217* (holotype, SAU). Figure 1.

Haec species *Fagopyro gracilipedi* (Hemsl.) Dammer ex Diels affinis, sed ab eo plantis omnino dense erecto-villosis, caulibus et ramis crassioribus, nodis comparate numerosis, internodiis brevibus, foliis ovatis usque cordatis supra tenuiter rugosis et manifeste minute pustulatis, petiolis longioribus atque acheniis minoribus differt.

Plants annual, 17–70 cm tall; stems mostly erect, sometimes declining or nearly horizontal, usually branched basally, reddish brown, densely villose with long, erect, white hairs, finely grooved; nodes numerous, internodes 1–4.5(–6.8) cm. Leaves alternate, entire; petioles (0.5–)2.6–5.3(–7.5) cm, greenish to reddish brown, densely white villous, finely grooved; leaf sheaths membranous, obliquely tube-shaped, 6–9 cm, with 9 to 15 green veins, villous, long acuminate to caudate apically, sometimes nearly awn-like, simple or bisected; blades papery, white villous with small blistery projections on both surfaces, green to dark green adaxially, green to grayish green abaxially, (0.9–)1.7–5.5(–6) × (0.7–)1.2–4.6(–5.1) cm, ovate to cordate, cordate or occasionally truncate basally, lateral segments usually not pendulous,

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Table 1. Taxa and collection information of specimens for the karyotype analysis.

Taxa	Locality	Habitat	Collection date	Altitude (m)	Voucher
Fagopyrum gracilipes (Hemsl.) Dammer ex Diels	Liangshang, Sichuan	wet sites in valleys	19 Aug. 2006	950–1300	*Yu Tang & Ji-Rong Shao s.n.* (SAU)
F. cymosum (Trevir.) Meisn.	Ganzi, Sichuan	near riverbanks dominated by shrubs	27 July 2007	600–1000	*Ji-Rong Shao & Da-Quan Bai s.n.* (SAU)
F. pugense T. Yu	Liangshang, Sichuan	wet sites in valleys	19 Aug. 2006	900–1400	*Yu Tang & Ji-Rong Shao s.n.* (SAU)
F. gracilipes var. *odontopterum* (Gross) Samuelss.	Liangshang, Sichuan	moist areas	19 Aug. 2006	850–1200	*Yu Tang & Ji-Rong Shao s.n.* (SAU)
F. tataricum (L.) Gaertn.	Aba, Sichuan	dry slope	27 July 2007	1000–1650	*Ji-Rong Shao & Da-Quan Bai s.n.* (SAU)
F. esculentum Moench	Aba, Sichuan	moist areas	27 July 2007	1100–1600	*Ji-Rong Shao & Da-Quan Bai s.n.* (SAU)

acuminate to nearly pungent apically, margins microciliated; basal veins 7 or 8, lateral veins in (5)6 to 9 pairs, sunken adaxially, projecting abaxially. Inflorescences racemose, axillary and terminal, 2–12 cm; rachis 4-edged, green to brownish, white villous, finely grooved; bracts, when present, foliaceous, ovate to broadly ovate, 0.4–1.4 × 0.5–1.2 cm, finely pubescent, cordate basally, short-acuminate to pungent apically, basal veins 7 to 9, terminated by a cluster of 1–1.2 cm hairs. Flowers usually in lax clusters (0.15–)0.2–1.8 cm apart; bracts funnelform, 2–3 mm, densely hairy with 3 green veins, central vein projecting to an acuminate apex; florets 2 to 4 per bract, the pedicel articulate apically, linear, 1.5–2.5 mm, often greenish, glabrous; tepals 5, elliptic to narrowly cordate, 1.3–2 × 1.1–1.5(–1.8) mm, greenish or yellowish green; styles 3, 0.5–0.6 mm, glabrous; stigma capitate. Fruit a capsule firmly enclosed by the perianth, black or blackish brown, (1.8–)2–2.5 × (1.5–)1.8–2 mm, trigonous, glabrous, smooth, rounded basally, obtuse apically. Chromosome number: $2n = 16$.

Distribution and habitat. *Fagopyrum pugense* is known only from wet sites in valleys or on riverbanks dominated by shrubs in and around Liangshan, Sichuan Province, China, at elevations from 900 to 1400 m.

Figure 1. *Fagopyrum pugense* T. Yu. —A. Habit. —B. Flower. —C. Stigma. —D. Tepal. —E. Stamens and stigma. —F. Achene and subtending bractlet. —G. Subtending bractlet. Drawn by Wei Hou from *T. Yu 4217* and *T. Yu 4315* (SAU).

Figure 2. *Fagopyrum pugense* T. Yu. —A. Root tip cell chromosomes. —B. Idiograms.

IUCN Red List category. *Fagopyrum pugense* is assessed here as Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001) because of its relatively extensive distribution and because the areas in which it has been collected are part of a protected habitat.

Phenology. *Fagopyrum pugense* has been collected in flower from July to October and in fruit from August to November.

Etymology. The specific epithet refers to the type locality, Puge County, Sichuan Province, China.

Karyotype. Karyotypes of *Fagopyrum pugense* and *F. gracilipes* were studied and compared. Mitotic metaphase idiograms of the new species are shown in Figure 2. The somatic chromosomes of *F. pugense* indicate that the plant is a diploid with a chromosome number of $2n = 2x = 16$; all 16 chromosomes are metacentric. *Fagopyrum gracilipes* is a tetraploid with a chromosome number of $4n = 4x = 32$; 30 chromosomes are metacentric and two are submetacentric, both of which should be assigned to category 1A (Stebbins, 1971). No satellites were observed on chromosomes of either *F. pugense* or *F. gracilipes*.

The following key is based on an excerpt from the key in *Florae Reipublicae Popularis Sinicae* (Li, 1998).

Key to Species of *Fagopyrum* sect. *Fagopyrum*

1a. Flowers in lax clusters, interrupted; pedicel articulate apically; plants wild.
  2a. Plants with spreading hairs; leaves lacking small blistery projections; achenes usually 5–6 mm long . . . . . *F. gracilipes*
  2b. Plant with erect hairs; leaves with small blistery projections; achenes (1.8–)2–2.5 mm long . . . . . *F. pugense*
1b. Flowers not in lax clusters, compactly arranged; pedicel not articulate apically; achenes 5–6 mm long; plants cultivated . . . . . *F. esculentum*

Paratypes. CHINA. **Sichuan:** Puge Co., LuoJishan town, in a thick growth of grass on slopes, 1260 m, 16 Sep. 2006, *T. Yu Ghassot 4315* (SAU).

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A New Species of Pandanaceae from Northern Madagascar, *Pandanus ankaranensis*

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ABSTRACT. A new species, *Pandanus ankaranensis* Callm. & Laivao (Pandanaceae), is described from the karst region of Ankarana in northern Madagascar. It resembles *P. grallatus* B. C. Stone, another member of *Pandanus* sect. *Mammillares* H. St. John occurring in the area. The new taxon can be distinguished by its larger and wider leaves that are persistent on the branches, the stipe often lying on the rocks where plants grow, and its larger syncarps. *Pandanus ankaranensis* is classified as Vulnerable based on IUCN Red List criteria.

RÉSUMÉ. Une nouvelle espèce, *Pandanus ankaranensis* Callm. & Laivao (Pandanaceae), est décrite de la région karstique de l'Ankarana au nord de Madagascar. Elle est proche de *P. grallatus* B. C. Stone, une autre espèce de *Pandanus* sect. *Mammillares* H. St. John qui pousse dans la région, mais s'en distingue par des feuilles plus longues et plus larges qui sont persistantes sur les branches, le stipe souvent couché sur les rochers et par les dimensions de son syncarpe. *Pandanus ankaranensis* est classé Vulnérable selon le Liste Rouge de l'UICN.

Key words: IUCN Red List, Madagascar, Pandanaceae, *Pandanus*.

Madagascar is one of the centers of diversity of the genus *Pandanus* Parkinson, with ca. 90 species, one third of which occur in the northern part of the island (Callmander et al., 2003). This region is one of the most biogeographically complex parts of the island (Battistini, 1965), and it is also one of the least explored. In order to address this gap in botanical knowledge, a coordinated set of inventory projects was conducted in northern Madagascar between 2003 and 2008 under the International Cooperative Biodiversity Group (ICBG) program (see Cao & Kingston, 2009), focusing on the drier parts of the region. A total of ca. 3600 collections were gathered over the course of five years. The specimens resulting from such initiatives have proven to be very helpful when describing new Malagasy species of plants, e.g., *Bathiorhamnus capuronii* Callm., Phillipson & Buerki (Rhamnaceae, Callmander et al., 2008), *Ludia craggiana* Z. S. Rogers, Randrianasolo & J. S. Mill. (Flacourtiaceae, Rogers et al., 2006a), and *Olax antsiranensis* Z. S.

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Rogers, Malécot & Sikes (Olacaceae, Rogers et al., 2006b).

While most *Pandanus* species are known from the humid regions of Madagascar, several previously published members of the genus occur in dry areas in the northern part of the island, including *P. analamerensis* Huynh, *P. coriaceus* Huynh, *P. flagellaris* B. C. Stone, and *P. grallatus* B. C. Stone (Stone, 1975; Huynh, 2000). All of these species have been recorded from around Ambilobe and/or Daraina, and the first two are also known from farther north at Montagne des Français. Two additional species, *P. biceps* B. C. Stone & Guillaumet and *P. pristis* B. C. Stone, are currently known only from the Ankarana massif, a karstic plateau of ca. 150 km² dating from the Jurassic (Rossi, 1980) that is home to many endemic plants, including the new species described here.

Pandanus ankaranensis Callm. & Laivao, sp. nov. TYPE: Madagascar. Prov. Antsiranana: Diana, Ambilobe, Marivorahona, forêt d'Ampondrabe, à 10 km E du village de Mahamasina, Ankarana, forêt sèche, 12°59′52″S, 49°11′16″E, 223 m, 8 Dec. 2007, *R. Randrianaivo, R. Rakotondrajaona, S. Randrianasolo, C. Claude, V. Benjara, M. Bezara & Bezandry 1515* (holotype, MO; isotypes, G, P, TAN). Figures 1, 2.

Haec species inter congeneros madagascarienses *Pandano grallato* B. C. Stone simillima, sed a hoc foliis latioribus longioribusque atque infructescentia drupisque majoribus, ab omnibus habitu arboris caule saepe in saxa incumbente atque foliis mortuis ad ramos erectos persistentibus distinguitur.

Tree to 8 m, stem prickly, 7–10 cm diam., erect or decumbent on rocks, branches few; prop roots abundant. Leaves gradually attenuate in the distal part, those borne apically on the trunk as long as those on lateral branches, (55–)75–95 × (3–)4.5–5.5 cm; old leaves persistent on branch; dry leaves coriaceous, lacking auricles, longitudinal veins visible on both surfaces; marginal prickles borne from 4–8 cm above the blade base to the apex, antrorse, 4–5 mm in the lower 1/3, 6–20 mm apart, strong, ca. 2 mm in the middle 1/3, 4–9 mm apart, to 1 mm in the distal 1/3, 3(–6) mm apart; midrib armed, prickles < 2 mm, randomly disposed (0.8–1.8 cm) and slightly prominent, antrorse in the distal 1/2, then smaller (ca. 1 mm), regularly disposed, spaced 2–8 mm apart and prominent; sheath 4–7 cm, ca. 4.5 cm wide at apex, ca. 5 cm wide at base. Flowers not seen; male flowers unknown. Infructescence terminal, the solitary syncarp erect on a straight peduncle; syncarp 13–14 cm diam., subspherical; peduncle 17–26 cm, 1.4–1.7 cm wide at apex, 0.8–0.9 cm wide at middle, straight, trigonous, veins visible, bracts to as many as 10 on entire peduncle. Drupes 11 or 12, connate in the mature syncarp, 50–60 × 45–50 × 38–46 mm, (4- or) 5-angled; pileus convex, 1/3–1/2 of superior portion free; stigmas 5 to 8, reniform, plane to oblique, gathered in the center of the pileus, 3–6 mm apart, slightly heightened (1–2 mm), apical sinuses 1–5 mm deep, alternating with the stigmas; endocarp 10–12 mm long in the center, ca. 25 mm wide, ca. 20 mm away from the stigmas; seed locule oblong, ca. 11 × 5 mm, superior mesocarp compact; inferior mesocarp fibrous.

Distribution and habitat. *Pandanus ankaranensis* is only known from dry forests on eroded limestone in the Ankarana region of northern Madagascar. Three other *Pandanus* species are known from the karst plateau of Ankarana: two endemic to this locality (*P. biceps* and *P. pristis*) and *P. coriaceus*, which also grows farther north in dry forests on other substrates.

IUCN Red List category. *Pandanus ankaranensis* has an area of occurrence of 118 km², an area of occupancy of 27 km², and comprises three known subpopulations, two of which are located in a protected area (Ankarana). Using the methodology of Callmander et al. (2007) based on IUCN Red List criteria (IUCN, 2001), we assign a preliminary status of Vulnerable (VU D2).

Observations. *Pandanus ankaranensis* is placed in *Pandanus* subg. *Vinsonia* (Warb.) B. C. Stone following the infrageneric classification of Stone (1974)—a system that has "a practical value" and must "remain provisional and flexible" according to Stone (1975: 459). This subgenus certainly has "geographic unity" (Huynh, 1979: 474), and its evolutionary and phylogenetic unity will soon be tested as part of a molecular phylogenetic analysis now being conducted (by M.W.C. and other collaborators). It encompasses nearly all *Pandanus* species from Africa, Madagascar, the Mascarenes, the Comoros, and the Seychelles, with carpels either free or connate into phalanges, and bearing stigmas that vary greatly in form from reniform to spiniform (Stone, 1974). The new species is assigned to section *Mammillares* H. St. John, described to accommodate taxa that bear multiple reniform stigmas that are grouped in the center of the upper part of the drupes (St. John, 1960; Laivao et al., 2006).

Our new species is very distinctive, although in general aspects of the syncarp morphology it resembles *Pandanus grallatus*, which occurs in dry forests of northern Madagascar from north of Ambanja to Ambilobe (Stone, 1975) and Daraina. Both species

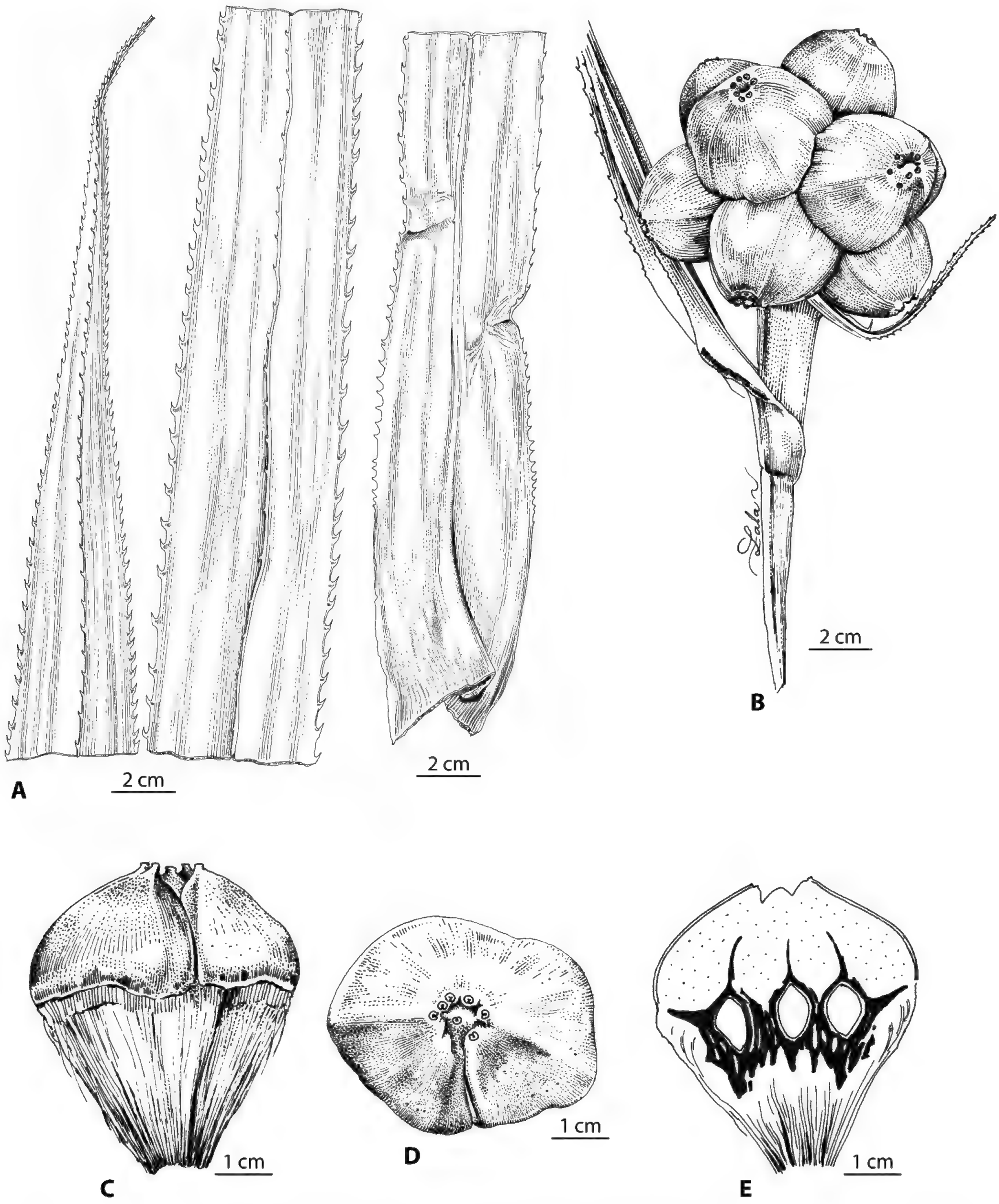

Figure 1. *Pandanus ankaranensis* Callm. & Laivao. —A. Leaf apex, midsection, and base. —B. Syncarp. —C. Lateral view of a drupe. —D. Apical view of a drupe showing the stigmas. —E. Longitudinal section of a drupe. Drawn from the holotype and isotype *Randrianaivo et al. 1515* (MO, TAN) and paratype *Callmander & Toly 49* (TAN).

differ from other members of section *Mammillares* in having sinuses in between the stigmas on the apex of the pileus, but *P. ankaranensis* differs from *P. grallatus* by its wider and longer leaves ([55–]75–95 × [3–]4.5–5.5 cm vs. 50–70 × ca. 2 cm in *P. grallatus*), larger infructescence (13–14 cm vs. ca. 5–5.5 cm diam.), longer peduncles (17–26 cm vs. ca. 10 cm), and larger drupes (5–6 × 4.5–5 × 3.8–4.6 cm vs. 2.2–2.7 × 2–2.6 × 1.8–2 cm). Furthermore, the new species described here can be recognized easily, even when sterile, by its unique habit. It forms a tree with the base of the trunk often prostrate and decumbent on rocks (Fig. 2) and dead leaves that persist on the branches. In contrast, *P. grallatus* is a slender treelet with an erect trunk and numerous ramifications, and leaves that do not persist on the branches.

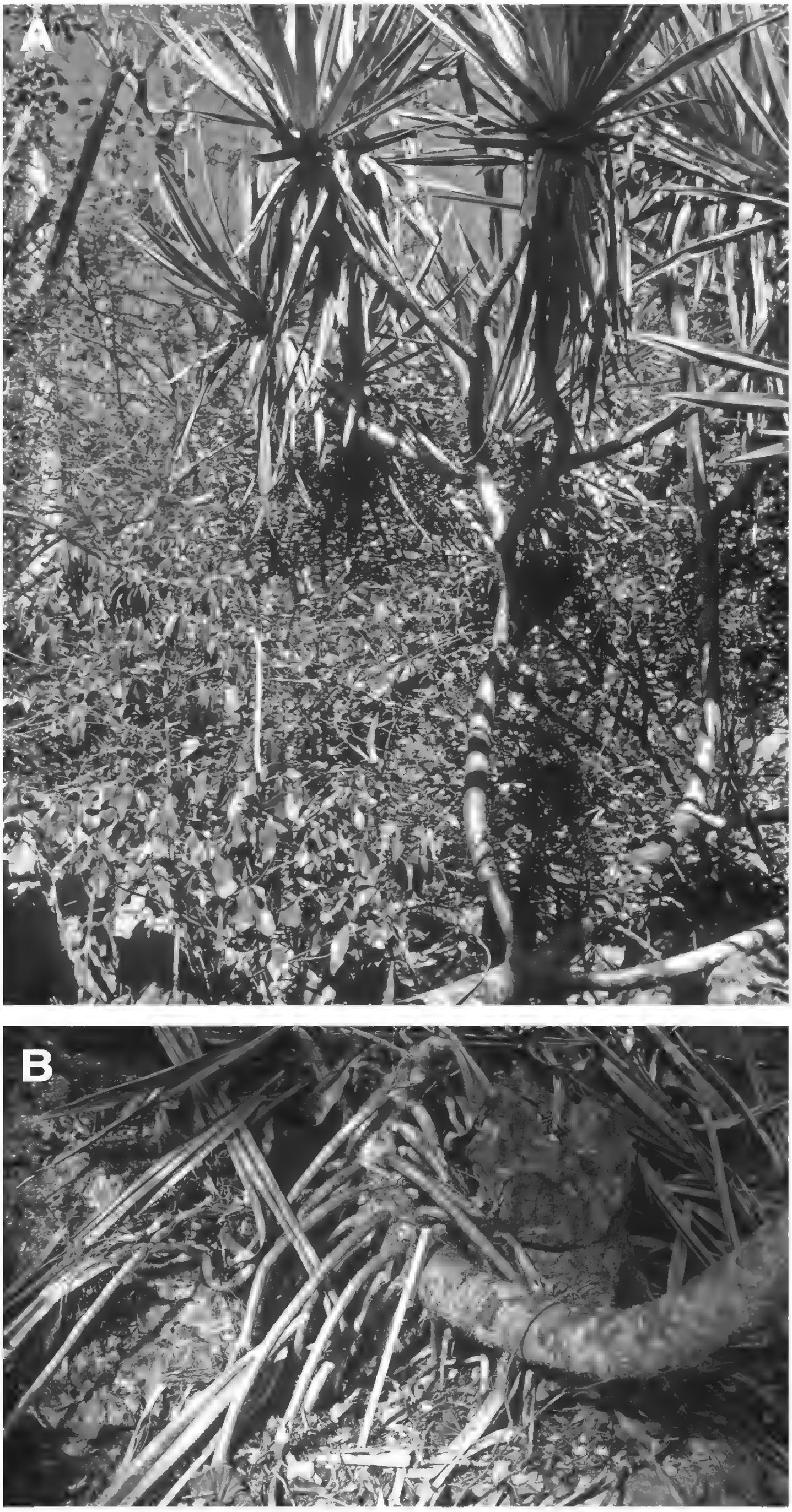

Figure 2. *Pandanus ankaranensis* Callm. & Laivao. —A. Habit showing leaves persistent on the branches. —B. Base of decumbent trunk with prop roots. Photos by M. W. Callmander from the paratype collection *Callmander & Toly 49*.

Paratypes. MADAGASCAR. **Prov. Antsiranana:** Ambilobe, Ankarana, sur les rochers calcaire, 150 m, 12°55′S, 49°06′E, 30 Aug. 1997 (fr.), *M. W. Callmander & A. Toly 49* (G, P, TAN); Ankarana vers la forêt de Mahory (Sud de Diégo-Suarez), [12°49′S, 49°14′E], 14 Aug. 1973 (fr.), *G. Cremers 2466* (KLU, MO, P, PH, TAN).

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Croton rufolepidotus (Euphorbiaceae s. str.), a New Species from Antioquia, Colombia

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Abstract. *Croton rufolepidotus* Caruzo & Riina (Euphorbiaceae s. str.), a new species from Colombia, is here described and illustrated. The new species is endemic to an area of lowland secondary forests in Antioquia. Morphological characters indicate that this species belongs to *Croton* sect. *Cleodora* (Klotzsch) Baill. due to its arborescent habit, petiolar glands, 15 to 25 stamens, as well as the pistillate flowers with imbricate sepals and multifid styles.

Key words: Colombia, *Croton*, *Croton* sect. *Cleodora*, Euphorbiaceae, IUCN Red List.

Croton L. is a pantropical genus with an estimated 1223 species in the Euphorbiaceae family (Govaerts et al., 2000). Although the genus occurs mostly in tropical regions worldwide, it also has some representatives in subtropical and northern temperate areas. In the Neotropics, its centers of diversity are Brazil, the West Indies, and Mexico (Burger & Huft, 1995). In Colombia, there are 80 species of *Croton* (Murillo, 2004), including herbs, shrubs, and trees occurring in all kinds of habitats, with the greatest number of species concentrated in the Andean region of the country (Murillo, 1999). As a result of ongoing systematic studies on *Croton* sect. *Cleodora* (Klotzsch) Baill. by the senior author, new species have been described for that section (Caruzo et al., 2008, 2010). In this paper, we describe *C. rufolepidotus* Caruzo & Riina, a new species of *Croton* sect. *Cleodora* known from Antioquia Department, Colombia, where it grows in lowland secondary forests.

Croton rufolepidotus Caruzo & Riina, sp. nov. TYPE: Colombia. Antioquia: Tarazá, Corr. El 12, camino El 12–Barro Blanco, Km 4 NO Medellín, 210 km en troncal del Caribe, bht/bmht, 7°30′N, 75°16′W, 25 July 1987, *R. Callejas, J. Betancur & F. J. Roldán 3611* (holotype, MO; isotypes, DAV, HUA, US). Figure 1.

Haec species *Crotoni salutari* Casar. affinis, sed ramulis cylindricis, stipulis auriculatis, inflorescentiae omnibus cymulis proximalibus pistillatis, bracteis linearibus, staminibus 15 ad 25, floribus femineis majoribus lobis calycis foliaceis non carnosis petalis reductis carentibus et stylis multifidis differt.

Tree 6–10 m tall, monoecious, indument rufous-silvery, lepidote trichomes without a central ray, trichomes pale, reddish, or sometimes with a reddish center and a pale margin; branchlets terete, rufous-silvery, covered by reddish and scattered pale trichomes. *Leaves* alternate; lamina 3–11.5 × 1–4.5 cm, narrowly ovate to ovate-elliptic, discolorous, apex narrowly acute to acuminate, base rounded to slightly cordate, margin entire, adaxial surface glabrous, abaxial surface densely lepidote, covered by pale trichomes and scattered reddish trichomes or trichomes with a reddish center and a pale margin, venation pinnate, brochidodromous, secondary veins 5 to 11, abruptly upturned toward the next ones, tertiary veins inconspicuous; petiole 0.5–1.5 cm, with a pair of stalked basilaminar glands ca. 1 mm diam., stalks 1–1.5 mm; stipules 0.5–1.5 cm, auriculate, apex caudate, deciduous. *Inflorescence* 2.5–6.5 cm, terminal; inflorescence axis terete, striate, lepidote; proximal cymules pistillate, with a single flower, distal cymules staminate, with 1 or 2 flowers, bracts 3–5 mm, linear, prophylls inconspicuous. *Staminate flowers* ca. 1 cm, campanulate, pedicels ca. 6 mm; calyx ca. 4 mm, lepidote externally, rufous-silvery, covered by reddish and scattered pale trichomes, glabrate internally; calyx lobes 5, united up to half of their length, ca. 2 mm, entire, equal, valvate, triangular, apex acute; petals ca. 4 mm, spatulate, densely villous externally, apex with an uneven margin; disk 5-segmented; stamens 15 to 25, filaments subulate; receptacle villose with simple trichomes. *Pistillate flowers* 1–1.4 cm, flask-shaped; pedicel 4–6 mm; calyx 6–8 mm, lepidote externally, rufous-silvery, covered by reddish and scattered

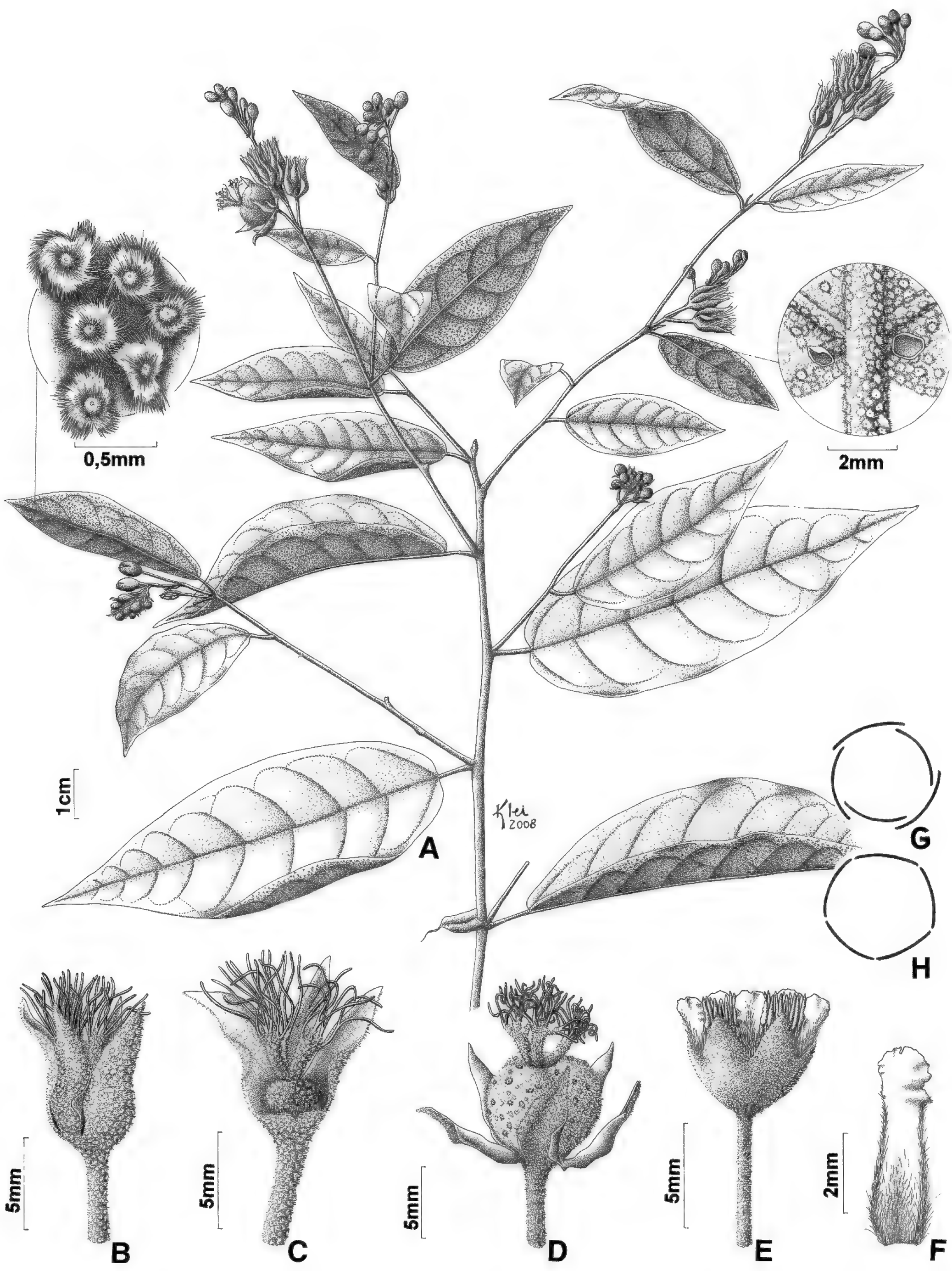

Figure 1. *Croton rufolepidotus* Caruzo & Riina. —A. Branch with flowers and fruits. —B. Pistillate flower. —C. Detail of the gynoecium. —D. Fruit. —E. Staminate flower. —F. Petal of the staminate flower. —G. Aestivation of the pistillate sepals. —H. Aestivation of the staminate sepals. Drawn from the holotype *Callejas et al. 3611* (MO).

pale trichomes, glabrate internally; calyx lobes 5, united at the base, 6–8 mm, equal, quincuncial, ovate-lanceolate, foliaceous, not fleshy; petals absent; disk entire, slightly 5-lobed; ovary sub-globose, lepidote; styles 3, connate at the base, then divided into 3 short columns ca. 1/3–1/2 of the stylar length, each one branching into 8 terminal arms, with a total of 24 tips. *Capsules* ca. 1.5 cm,

Table 1. Principal characters distinguishing *Croton rufolepidotus* from *C. salutaris*.

Character	*C. rufolepidotus*	*C. salutaris*
Trichomes	lepidote without a central ray	lepidote-porrect, with a long central ray
Branchlet shape	terete	angular
Stipule shape	auriculate	linear-lanceolate
Bract shape	linear	subulate
Proximal cymules of inflorescence	pistillate	pistillate and staminate
Stamen number	15 to 25	15
Pistillate flower length (mm)	10–14	7–8
Pistillate calyx length (mm)	6–8	3–4
Pistillate calyx lobes	not fleshy	fleshy
Reduced pistillate petals	absent	present
Pistillate sepals in fruit	slightly accrescent	not accrescent
Division of styles	multifid (more than 12 terminal tips)	quadrifid (12 terminal tips)
Habitat	lowland secondary forest	montane rainforest
Distribution	Antioquia, Colombia	southeastern Brazil

subglobose, 3-angled, lepidote, sepals slightly accrescent; seeds not seen.

Distribution and habitat. *Croton rufolepidotus* is endemic to Antioquia, Colombia, where it grows in lowland secondary forests, between 180 and 310 m elevation. According to R. Callejas (pers. comm.), much of the area where this species has been collected has since been deforested for coca plantations (*Erythroxylum coca* Lam. and *E. novogranatense* (D. Morris) Hieron.).

IUCN Red List category. Following IUCN Red List criteria (IUCN, 2001), *Croton rufolepidotus* can be considered as Critically Endangered (CR B1ab) due to its restricted distribution (known from only one location) and the continuing decline of the area and quality of habitat where the species occurs.

Etymology. The specific epithet of this new species is taken from the Latin and refers to the rufous color of its lepidote indument.

Relationships. Following the sectional synopsis of *Croton* by Webster (1993), and based on current revisionary work and phylogenetic studies on *Croton* sect. *Cleodora* by the first author, the new species clearly belongs to this Neotropical section. The suite of characters shared by members of section *Cleodora* are the arborescent habit; the petiolar glands in an abaxial or lateral position; 15 to 25 stamens; quincuncial or imbricate, usually accrescent, and sometimes fused pistillate sepals; and quadrifid (12 terminal tips) or multifid (more than 12 terminal tips) styles fused at the base or into a longer column.

Among the other species within section *Cleodora*, this new species is morphologically most similar to *Croton salutaris* Casar. from the Atlantic rainforest of southeastern Brazil (São Paulo, Minas Gerais, Rio de Janeiro, and Espírito Santo states), but that species differs from *C. rufolepidotus* in several features, which are shown in Table 1. The vegetative features that best distinguish *C. salutaris* from *C. rufolepidotus* are the stipule shape (linear-lanceolate in *C. salutaris* vs. auriculate in *C. rufolepidotus*) and branchlet morphology (angular in *C. salutaris* vs. terete in *C. rufolepidotus*).

Paratypes. COLOMBIA. **Antioquia:** Tarazá, Corr. El Doce, 210 km NNE of Medellín, carr. El Doce–Barro Blanco, near entrance to Hac. Las Mercedes, rd. outside of finca, 7°30′N, 75°16′W, 25 July 1987, *W. W. Thomas & C. J. Castaño C. 5525* (COL, HUA, JAUM, MO, NY); Tarazá, Corr. El 12, Vía El Doce–Barro Blanco, Hac. las Mercedes, potrero San Juan, bht/bhmt, 7°30′N, 75°20′W, 7 Nov. 1987, *R. Callejas, F. J. Roldán, A. L. Arbeláez & D. L. Echeverry 5425* (F, HUA).

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Chroniochilus sinicus, a New Species of Orchidaceae from Yunnan, China

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ABSTRACT. *Chroniochilus sinicus* L. J. Chen & Z. J. Liu, a new species, is described for the Orchidaceae from Yunnan, China, and accordingly the genus *Chroniochilus* J. J. Sm. is first reported from China. The new species differs from the allied species *C. virescens* (Ridl.) Holttum by having much larger leaves (7–10 cm), much longer inflorescences (to 18 cm), tiny bracts, and a cordate-conical lip constricted in its upper portion, with side-lobes 3.5–4.5 mm long.

Key words: China, *Chroniochilus*, IUCN Red List, Orchidaceae, Yunnan.

Chroniochilus J. J. Sm. (Orchidaceae, Vandeae) is a small genus of ca. five species occurring in Thailand, Malaysia, Indonesia, and now China (Seidenfaden, 1988; Seidenfaden & Wood, 1992). It is characterized by the flower having two pollinia that are not cleft, split, or porate; a distinct column-foot; and a spurless, solid, conical lip. Our plant was collected from Malipo County in southeastern Yunnan, China. Many individuals of this entity were seen growing on tree trunks with their stems and inflorescences pendulous. Their habit and fruit was similar in appearance to some species of *Thrixspermum* Lour., but the floral structure was quite different with only two pollinia and a conical lip. The pollinium was not cartilaginous or bony, but slightly soft, with an obscure but indehiscent stripe on its surface. The lip and column of the new orchid were similar to those of *Chroniochilus* species, but the leaves and inflorescence differ significantly. Our plant is treated here as a new species, and accordingly this is the first report for the genus *Chroniochilus* in China.

Chroniochilus J. J. Sm., Bull. Jard. Bot. Buitenzorg sér. 2, 26: 81, 84. 1918. TYPE: *Chroniochilus tjidadapense* J. J. Sm.

Epiphytic plants; stems short or rather long, with 3 to 9 leaves. Leaves often bilobed at apex. Inflorescence racemose, many-flowered; flowers small, few open at a time; lip conical, fleshy, with large side-lobes backward-spreading, spurless, the conical part solid; column with a distinct foot to which the lip is movably attached; pollinia 2, not cleft, split, or porate, on a narrowly oblong or linear stipe; viscidium small.

Chroniochilus sinicus L. J. Chen & Z. J. Liu, sp. nov. TYPE: China. Yunnan: Malipo Co., Chuantou, 23°07′N, 104°38′E, on tree, 1000 m, 27 Aug. 2008, *Z. J. Liu 4143* (holotype, NOCC). Figures 1, 2.

Species nova *Chroniochilo virescenti* (Ridl.) Holttum subsimilis, a quo foliis majoribus 7–10 cm longis, inflorescentia pendula 8.5–18 cm longa, bracteis minoribus 1–1.5 mm longis atque labello cordato-conico in parte superiore constricto lobis lateralibus longioribus 3.5–4.5 mm longis differt.

Epiphytic plants; stems 2–5 cm × 3–4 mm diam., slightly flexuous. Leaves 3 to 9, distichous, somewhat fleshy, suboblong, slightly falcate, 7–10 × 1.4–2.1 cm, unequally bilobed at apex, base amplexicaul sheathing. Inflorescence lateral, racemose, 8.5–18 cm, pendulous, sparsely 10- to 33-flowered; peduncle 2.5–5 cm; rachis continuously elongating with anthesis; floral bracts 1 or 2, broadly ovate, 1–1.5 mm; pedicel and ovary 5.5–6 mm. Flowers widely opening, white, marked with purple-red stripes on lateral lobes and a purple-red patch on apical part of lip; column white and marked with red-brown stripes; dorsal sepal subelliptic, slightly concave, ca. 5.5 × 4 mm, shortly acuminate at apex; lateral sepals subobovate-oblong, 6–7 × 3–4 mm, obtuse at apex; petals subobovate to elliptic, 9–10 × 3–4 mm, obtuse-rounded at apex, base slightly clawed; lip thick-fleshy, cordate-conical, ca. 3.5–4.5 × 2.5–3.6 mm, movable, constricted in upper part, with a fleshy cushion centrally; side-lobes spreading backward, parallel to column-foot, oblong, 3.5–4.5 × 1.7–1.9 mm, rounded to obtuse at apex; column ca. 2 mm, with a distinct foot to 4 mm long; anther-cap yellow, conical. Capsule (immature seen only) terete, ca. 6 cm × 3 mm.

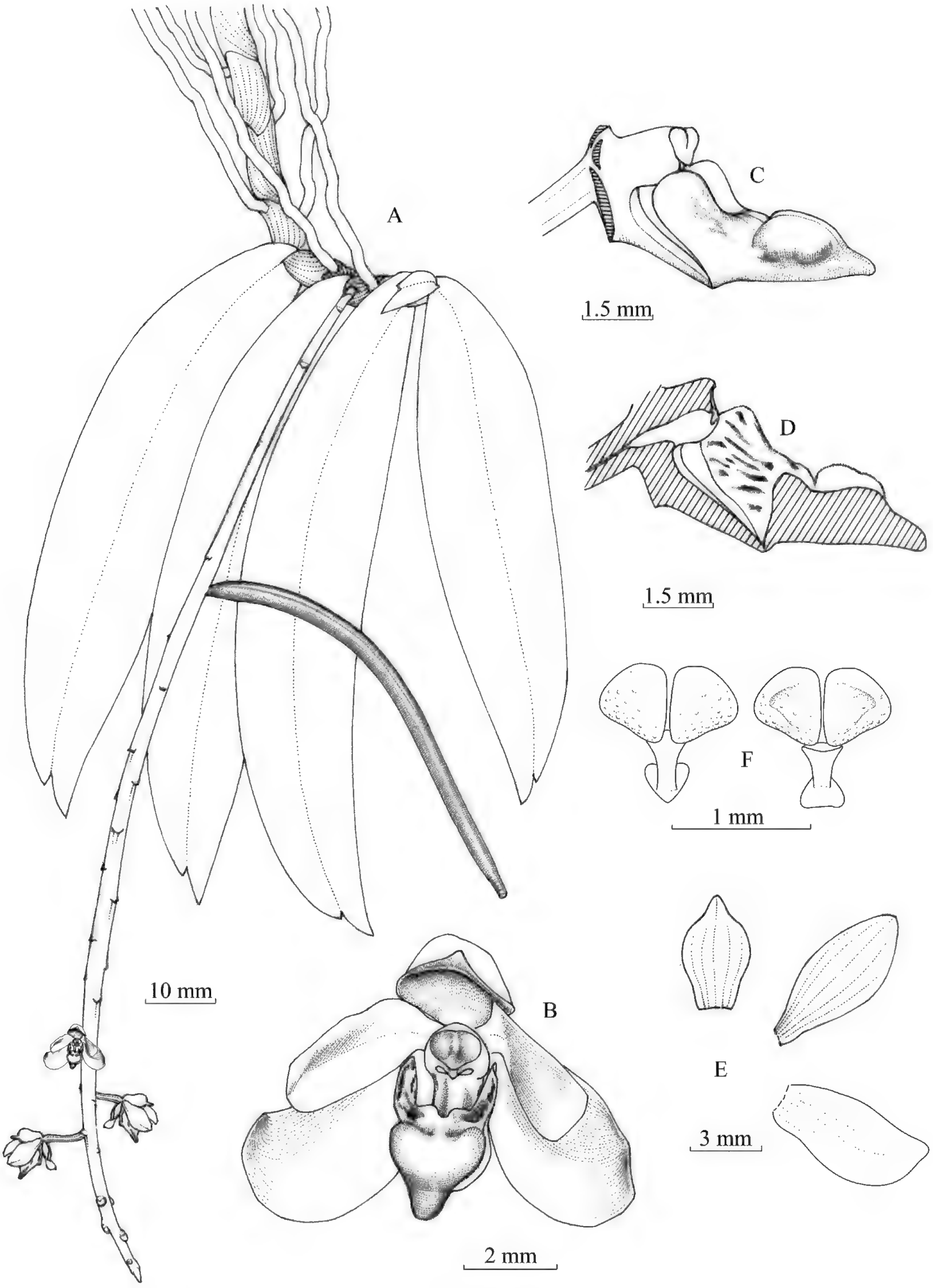

Figure 1. *Chroniochilus sinicus* L. J. Chen & Z. J. Liu. —A. Flowering and fruiting plant. —B. Flower. —C. Column and lip, side view. —D. Column and lip, longitudinal section. —E. Dorsal sepal, petal, and lateral sepal (clockwise from top). —F. Pollinarium, front view (left) and back view (right). Drawn by X. Y. Ma from the type *Z. J. Liu 4143* (NOCC).

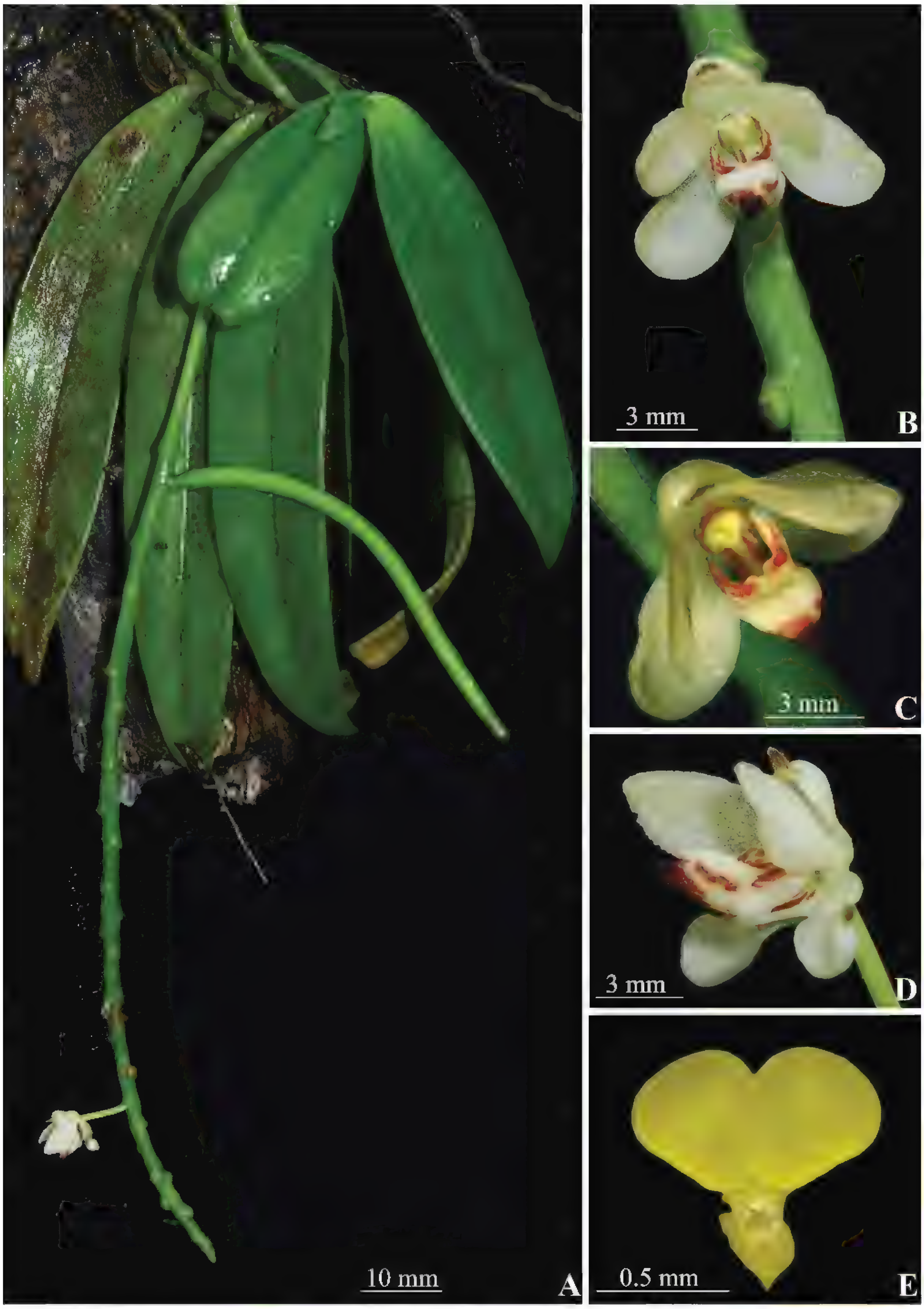

Figure 2. *Chroniochilus sinicus* L. J. Chen & Z. J. Liu. —A. Flowering plant with young fruit. —B–D. Flowers. —E. Pollinarium. From the type *Z. J. Liu 4143* (NOCC).

Distribution and habitat. *Chroniochilus sinicus* is known only from the type locality in Malipo County, Yunnan Province. The species was found growing on tree trunks in evergreen broad-leaved forests in limestone areas, at an altitude of 1000 m.

IUCN Red List category. *Chroniochilus sinicus* is assessed here as Endangered (EN) according to IUCN Red List criteria (IUCN, 2001). Within the type locality and adjacent areas, we searched 20 locations within a 10-km radius from Chuantou in Malipo County. We

found this species in only three of the 20 locations, all less than 1 km from the type locality. Altogether, including the type locality, only 17 individuals were seen in the wild, with four, three, five, and five individuals, respectively, in each location. The rarity of this species may be the result of the destruction of its habitat, as some of the broad-leaved evergreen forests have been destroyed or replaced by planted forests or economic forests, and, to a lesser degree, by its own viability. It is therefore considered to be facing a very high risk of extinction in the wild.

Phenology. The new species was observed in flower from August to October in the wild.

Relationships. The new species is somewhat similar to *Chroniochilus virescens* (Ridl.) Holttum, from which it differs by having larger leaves (7–10 × 1.4–2.1 cm vs. 3–4[–7] × ca. 1 cm in *C. virescens*), a longer inflorescence (8.5–18 cm vs. 1.5–3 cm), broad-ovate bracts 1–1.5 mm long (vs. ovate-lanceolate bracts to 2–3 mm long), a cordate-conical lip constricted in the upper part (vs. lip conical), and longer side-lobes (3.5–4.5 mm vs. 1.5–2 mm). In addition, *C. sinicus* also superficially resembles *Parapteroceras elobe* (Seidenf.) Aver.; the new species differs by its spurlike lip that is solid and lacks a midlobe, the inflorescence that is much longer than the leaves, and the pollinarium with a much narrower stipe and viscidium.

Paratype. CHINA. **Yunnan:** Malipo Co., Chuantou, 21 Aug. 2009 (fl. in cult. at NOCC), *Z. J. Liu 4466* (PE).

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New Species of *Aidia* and *Polysphaeria* (Rubiaceae) from East Africa

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Abstract. The two species of *Aidia* Lour. (Rubiaceae, Gardenieae) newly described here bring this genus to three species in Tanzania and Kenya. *Aidia abeidii* S. E. Dawson & Gereau, from evergreen coastal forests of eastern Tanzania and Kenya, corresponds to an unnamed species mentioned in the Rubiaceae treatment for the *Flora of Tropical East Africa*. *Aidia crassifolia* S. E. Dawson & Gereau, from evergreen forests of northeastern and east-central Tanzania, is a larger tree or shrub with much larger inflorescences than the other two species of *Aidia* in tropical East Africa. The new species of *Polysphaeria* Hook. f. (Rubiaceae, Octotropideae), *P. ntemii* S. E. Dawson & Gereau, from evergreen forests of the East Usambara lowlands in Tanzania, corresponds to *Polysphaeria* sp. B of the *Flora of Tropical East Africa*.

Key words: *Aidia*, coastal forests, conservation, East Africa, Eastern Arc Mountains, Gardenieae, IUCN Red List, Kenya, Octotropideae, *Polysphaeria*, Rubiaceae, Tanzania, Uluguru Mountains, Usambara Mountains.

The Eastern Arc Mountains and coastal forests of Tanzania and Kenya are well known to support a high diversity of both plants and animals with extremely high concentrations of rare and endemic species (Myers et al., 2000; Critical Ecosystem Partnership Fund, 2003; Burgess et al., 2007; Hall et al., 2009). Recent and ongoing botanical exploration in this area continues to add to this number (e.g., Gereau & Bodine, 2005; Lantz & Gereau, 2005; Couvreur et al., 2006). Continuing this trend, three new species in two genera of Rubiaceae are described below.

Aidia

Aidia Lour. (Rubiaceae, Gardenieae; Robbrecht, 1993) is a genus of about 50 (Ridsdale, 1996) to 53 species of shrubs and trees of Africa, Asia, and the western Pacific region (Govaerts et al., 2009). In contrast to the general characterization of Rubiaceae, many species of the tribe Gardenieae, including species of *Aidia*, have resinous exudates. *Aidia* is distinguished within the Gardenieae by triangular stipules that are either shortly fused around the stem or free and interpetiolar; hermaphroditic 4- or 5-merous flowers; corolla lobes convolute in bud and overlapping to the left, 2(rarely 3)-locular ovaries with numerous ovules on peltate; axile placentas; baccate fruits; and a distinctive inflorescence arrangement. The inflorescences are congested to laxly cymose and borne on one side of the stem at or just above every second or third node in a pseudoaxillary or supraaxillary position. The inflorescence is sometimes positioned opposite a developed leaf but with the subtending leaf reduced or apparently lacking, or sometimes the node bearing the inflorescence is apparently leafless, with the leaf opposite the inflorescence reduced to an inconspicuous scale. The flowers often have secondary pollen presentation, with the non-receptive outer surface of the stigma forming an oblongoid to clavate, ridged pollen presenter on which the pollen of the same flower is first deposited, and then dispersed by pollinators from that position.

Verdcourt (1988a) reported one species and variety of *Aidia* from Tanzania and Kenya, *A. micrantha* (K. Schum.) Bullock ex F. White var. *msonju* (K. Krause) E. M. A. Petit, and suggested that another, possibly separate species, which he called *Aidia* sp., might also be found there based on very imperfect material. Recent botanical exploration in the region has now documented this second species as well as the other species newly described below. Both new species belong to *Aidia* sect. *Aidia*, as circumscribed by Ridsdale (1996), by the character combination of leaf-opposed inflorescences, lanceolate corolla lobes, linear anthers, and oblongoid (not clavate) pollen presenters.

Key to the Species of *Aidia* in East Africa (Kenya, Tanzania, Uganda)

1a. Tree or shrub 12–25 m tall; leaf blade moderately to somewhat thickly coriaceous; leaf subtending inflorescence reduced but not scalelike, ca. 8 ×

3.4 cm; inflorescence 75- to 100-flowered, 4.5–6.7 × 4.8–8.2 cm . . . . . *A. crassifolia*

1b. Tree or shrub to 12 m tall; leaf blade thinly coriaceous; leaf subtending inflorescence reduced and scalelike, 5.8–15 × ca. 0.5 mm; inflorescence 7- to 35-flowered, 1.5–4 × 3.2–5.5 cm.

2a. Leaves elliptic to elliptic-lanceolate, (3–)7–13 × 1–4.2 cm, with 5 or 6 lateral veins; inflorescence lax on peduncle 6–10 mm long; pedicels 0.5–3.8 mm long; flower 15.7–16 mm long; apex of bud rounded, outer surface glabrous; calyx limb 2–2.5 mm long; ovary with 12 to 22 ovules. Eastern Kenya and Tanzania, 40–360 m . . . . . *A. abeidii*

2b. Leaves elliptic, 10–16(–18) × 3–7 cm, with 7 or 8 lateral veins; inflorescence compact, sessile or on peduncle to 4 mm long; pedicels 3–9(–16) mm long; flower 15–23 mm long; apex of bud pointed, outer surface with fine white pubescence or glabrous; calyx limb 3–4 mm long; ovary with 50 to 100 ovules. Uganda, Tanzania, east-central and southern Africa, 1050–1800 m . . . . . *A. micrantha* var. *msonju*

1. Aidia abeidii S. E. Dawson & Gereau, sp. nov. TYPE: Tanzania. Pwani Region: Bagamoyo Distr., Zaraninge Forest, Gongo Village, near WWF office, 06°11′S, 38°36′E, 260 m, 1 July 1998 (fl.), *Y. S. Abeid 264* (holotype, K; isotypes, BR, M, MO, NHT, UPS). Figure 1.

Haec species quoad altitudinem 12 m non excedentem et inflorescentiam folio ad squamam reducto subtentam *Aidiae micranthae* (K. Schum.) Bullock ex F. White similis, sed ab ea foliorum venis secundariis 5 vel 6, inflorescentia laxa pedunculo longiore insidente, pedicellis saepe brevioribus, limbo calycino breviore atque ovario pauciovulato distinguitur.

Tree or somewhat scandent shrub (3–)8–12 m tall, to 30 cm DBH; bark gray, darker in patches; branches terete, 4.5–5 mm diam., glabrous; young shoots somewhat shining, smooth, turning gray-brown with flaky bark when mature; internodes evenly spaced between flowering and nonflowering nodes, 1.4–2.4 cm. Stipules clasping stem but pairs barely connate at base, triangular to broadly triangular, 3–4 × ca. 2.3 mm, articulated when mature, falling to leave a pale corky ring with thick colleters and pale trichomes at base, apex long-aristate, 1.5–3.8 mm, margins chartaceous, ciliate; petiole 2–6 mm, laterally impressed and channeled with rounded margin, pink when fresh, drying brown to dark brown, glabrous; leaf lamina elliptic to elliptic-lanceolate, (3–)7–13 × 1–4.2 cm, thinly coriaceous, drying bronze-brown to olive-green, paler abaxially, shiny adaxially when mature, glabrous, apex acuminate with short sharp apical point ca. 0.6 mm, base narrowly cuneate and sometimes slightly asymmetric; midrib depressed adaxially, sometimes pinkish; venation camptodromous to weakly brochidodromous with secondary veins 5 or 6 pairs, ascending at angle of 45°–50°; tertiary and higher-order veins visible and raised abaxially; domatia in axils of secondary and tertiary veins, ovate to elliptic, to 3 mm long, as raised bumps adaxially, as foveolae abaxially, pubescent at pit entrance with straight pale trichomes 0.2–0.4 mm, with white fibrous matter inside. Inflorescence lateral at nodes with subulate subtending scalelike leaf 5.8–8 × ca. 0.5 mm and opposing full-sized leaf, lax, 7- to 35-flowered, 2.4–4 × 3.2–5.5 cm; peduncle 6–10 mm, minutely puberulous with trichomes sometimes arranged in lines; primary inflorescence axes 3 to 6, cincinnoid; bracts and bracteoles in pairs at each node but subopposite at first node, articulated when mature, falling to leave a pale ring with many thick colleters and straight pale trichomes; bracts rounded, 1.7–1.8 × ca. 2 mm, chartaceous, drying pale brown, ciliate, with shortly cuspidate or aristate apical lobe ca. 0.7 mm; bracteoles similar to bracts, ca. 1 × 2 mm with apical lobe 0.3–0.4 mm; pedicels swollen and puberulous just below flower, 0.5–3.8 mm. Flower 15.7–16 mm; hypanthium turbinate, 3.7–4 mm, drying dark brown, glabrous; calyx limb funnel-shaped, 2–2.5 × ca. 3 mm, lobes rounded, ca. 0.5 mm, apex short-mucronulate, 0.2–0.4 mm, margins pale, chartaceous, ciliate; corolla rounded at apex in bud, ca. 14 mm at maturity, salverform, white, tube funnel-shaped, ca. 5 mm, ca. 3 mm diam. at widest point, glabrous outside, throat with 1.2–1.5 mm wide band of crisped trichomes 0.7–1.3 mm long at apex and narrow broken ring of straight trichomes 0.6–1.7 mm long just above at bases of lobes, lobes 6.3–6.8 × ca. 2.7 mm, glabrous, margins revolute, ciliate only in very young bud; anthers basifixed on curling filaments ca. 2.5 mm attached at base of corolla lobes, thecae ca. 5.7 × 0.6 mm, sterile apex 0.20–0.25 mm; ovary 2-locular, placentas attached to upper half of septum, ovules 12 to 22, embedded in fleshy placental matrix; disk depressed-cupular; style ca. 12 mm, pollen presenter ca. 6 × 1–1.2 mm. Fruit subglobose, wrinkled when dry, 5–6 × ca. 8.5 mm; calyx limb persistent; seeds 12 to 14, disk-shaped, ca. 2.3 mm diam., brown, finely striate.

Distribution and habitat. *Aidia abeidii* is known from eastern Tanzania and eastern Kenya in evergreen lowland dry to moist forest and grassland patches, at 40–360 m elevation.

Phenology. *Aidia abeidii* was observed in flower from April to July and October to December, with fruiting observed in April and September.

IUCN Red List category. With post facto georeferencing of historic specimens (*Peter 56092*, *56098*, *56165*; *Procter 2813*) and GIS mapping of

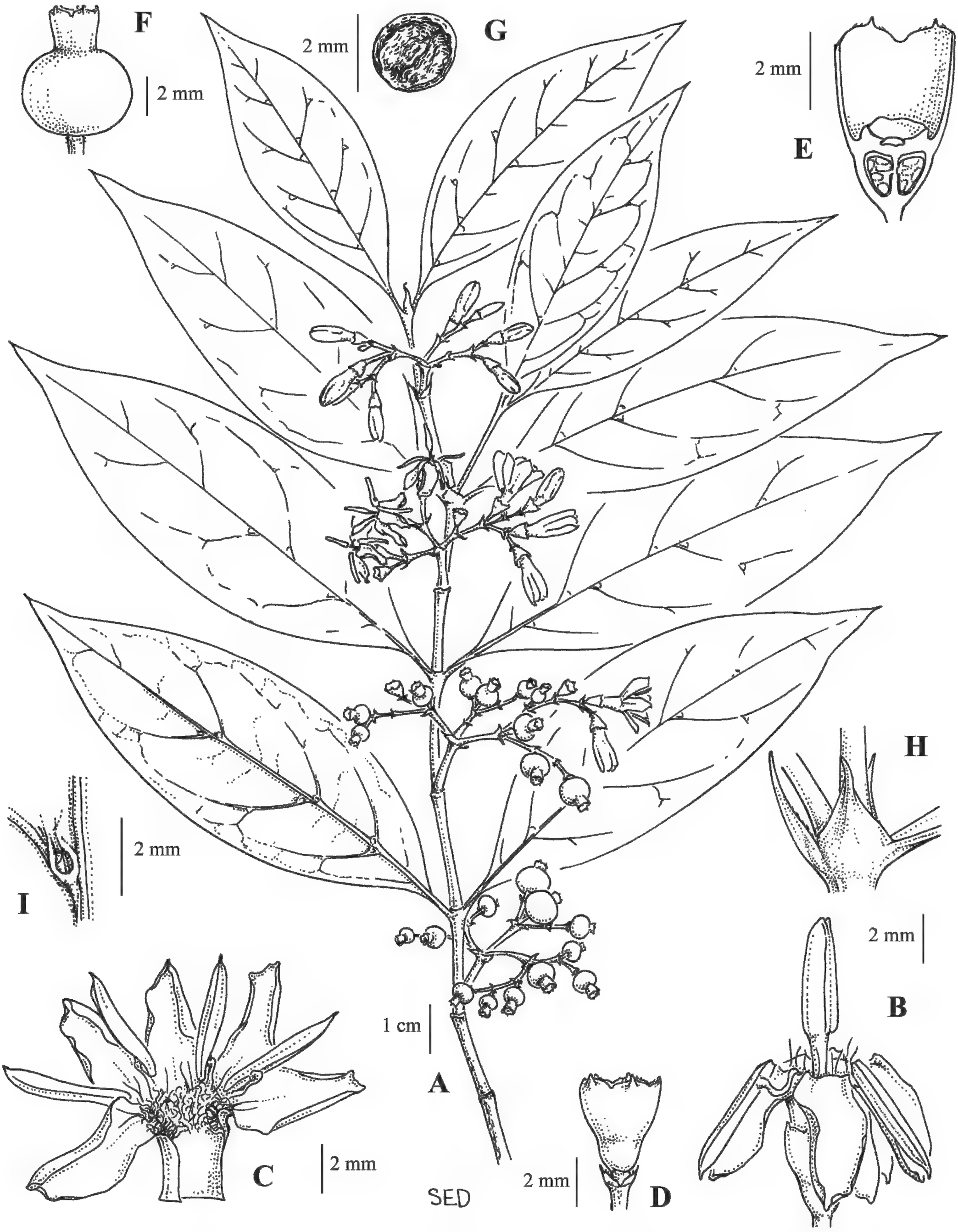

Figure 1. *Aidia abeidii* S. E. Dawson & Gereau. —A. Flowering and fruiting branch. —B. Flower. —C. Open flower. —D. Calyx. —E. Ovary, longitudinal section. —F. Fruit. —G. Seed. —H. Stipule. —I. Domatium in secondary vein axil on abaxial leaf surface. A–F, H, I from *W. R. Q. Luke 8317* (K); G from *A. Peter 56165* (K).

specimen localities (see specimen citations and distribution map at <www.tropicos.org/name/50322847>), we calculate an extent of occurrence (EOO) of almost 6900 km² and an area of occupancy (AOO) of just under 70 km² using a cell size of 3.16 km. Using IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2001), with an EOO of < 20,000 km², an AOO of < 2000 km², not more than 10 locations, and the continuing decline in extent and quality of coastal forest habitats due to land clearing and forest

conversion to agriculture throughout the region, we assign this species the IUCN Red List Category of Vulnerable, VU B1ab(iii)+2ab(iii).

Discussion. This new species corresponds to "*Aidia* sp. (aff. *gardneri* (Thwaites) Tirv.)" of Iversen (1991: 204) and "*Aidia* sp." of Verdcourt (1988a: 489), who distinguished the new species from *A. micrantha* by the leaves turning brown on drying, the laxer inflorescence, and the smaller calyx limb, and also suggested an apparent affinity with *A. gardneri* (Thwaites) Tirveng. The specific epithet commemorates the collector of the type, Yahya Shabani Abeid, who was employed at the time by the World Wildlife Fund Coastal Forest Programme. It can be distinguished from the other species of *Aidia* in East Africa by the characters indicated in the key.

Paratypes. KENYA. **Coast Province:** Kwale Distr., Gongoni, 04°24′S, 39°28′E, 40 m, 21 Oct. 1991 (fl. bud), *W. R. Q. Luke 2948* (EA, K, MO, US); Shimba Hills, Mwele Forest, 04°16′S, 39°22′ E, 360 m, 1 Apr. 2002 (fl., fr.), *W. R. Q. Luke 8317* (BR, EA, K, MO, NHT, UPS, US, Ukunda). TANZANIA. **Tanga Region:** Muheza Distr., by R. Sigi below Longuza [Longusa], 300 m, 18 Nov. 1917 (fl. bud), *A. Peter 56092* (K, MO); near Kwamtili, 5 Dec. 1917 (fl. bud), *A. Peter 56098* (K); 1 Sep. 1918 (fr.), *A. Peter 56165* (K). **Pwani Region:** Bagamoyo Distr., Zaraninge Forest, dry evergreen coastal forest on Kiono Plateau, 06°09′S, 38°36′E, 300 m, 25 Feb. 1990–18 Mar. 1994 (fr.), *Frontier-Tanzania 909* (BR, K, M, MO, RAB, UPS); Zaraninge Plateau, Dec. 1964 (fl. bud), *J. Procter 2813* (EA, K).

2. Aidia crassifolia S. E. Dawson & Gereau, sp. nov. TYPE: Tanzania. Tanga Region: Korogwe Distr., forest patch on roadside along rd. to Makweli village, W of tea factory, 05°03′53″S, 38°25′38″E, 1000 m, 22 Feb. 2000 (fl., fr.), *M. A. Mwangoka & E. Nyenga 1196* (holotype, K; isotypes, BR, M, MO, NHT, UPS). Figure 2.

Haec species a congeneris Africae orientalis statura altiore, lamina foliari crassiore atque inflorescentia multiflora longiore folio reducto non squamiformi subtenta distinguitur.

Tree or shrub 12–25 m tall, ca. 25 cm DBH; red resin or sap visible in some organs as shiny exudate on cut surfaces; branches terete, 3–6 mm diam., glabrous; young shoots drying black, smooth, turning brown with rough bark when mature; internodes evenly spaced between flowering and nonflowering nodes, 3–5 cm. Stipules clasping stem, narrowly triangular-lanceolate, ca. 11.5 × 3–6 mm, articulated when mature, falling to leave a pale corky ring with several thick bronze-brown colleters and pale trichomes at base, apex long-attenuate, ca. 5 mm, drying black-brown, ciliate; petiole 7–20 mm, laterally impressed and channeled, drying black to dark brown, glabrous; leaf lamina obovate, 8–18.5 × 3.4–8.1 cm, moderately to somewhat thickly coriaceous, drying bronze-brown when mature, paler abaxially, black when young, glabrous except at pale puberulous apex, apex long-acuminate to cuspidate with acumen 1.2–1.3 mm in young leaves, base narrowly cuneate to attenuate, slightly asymmetric; midrib depressed adaxially; venation weakly to strongly brochidodromous with secondary veins 6 to 8 pairs, ascending at angle of ca. 35° in lower and middle portion of lamina, ca. 55° near apex, joining to form strong submarginal vein 3–4 mm from margin, particularly well developed in mature leaves; tertiary and higher-order veins visible and raised abaxially; domatia in axils of secondary and tertiary veins, transversely elliptic to asymmetrically ovate, 0.5–1.5 × 0.8–1 mm, as raised bumps adaxially, as foveolae abaxially, usually pubescent at pit entrance with 1 to 25 straight pale trichomes 0.25–0.40 mm. Inflorescence observed only when very young and entirely enclosed in bracts and when old in transition to infructescence, lateral 1–1.5 mm above nodes with reduced subtending leaf ca. 8 × 3.4 cm and opposing full-sized leaf, moderately dense, 75- to 100-flowered, 4.5–6.7 × 4.8–8.2 cm; peduncle 13–15 mm, puberulous in young fruit, woody with puberulous-scurfy surface in mature fruit; primary inflorescence axes 3, cincinnoid, flattened and pushed up to form ridges and sometimes with red resin or sap visible at nodes of secondary branches; bracts and bracteoles in pairs, opposite to subopposite at each node, articulated when mature, falling to leave a ring with few thick colleters and pale trichomes; bracts triangular-acuminate, 2.5–3 mm, puberulous outside, glabrous and shiny inside when young, with aristate apical lobe ca. 0.5 mm; bracteoles similar to bracts, with thick brown colleters and pale trichomes on lower margin; pedicels ca. 5 mm below maturing fruit, ca. 3 mm from last bracteole to young fruit, pubescent. Flower with hypanthium crateriform, ca. 6 mm, puberulous; calyx limb tubular to funnel-shaped, ca. 4.2 × 3.6 mm, subcoriaceous, drying bronze-brown, puberulous, lobes 5 or 6, triangular, keeled, widening broadly at base, ca. 1.1 mm, margins reflexed, scarious, pale, sometimes with small narrowly triangular appendages between lobes; corolla ca. 17 mm, salverform, white, tube funnel-shaped, ca. 5.5 mm, ca. 2.2 mm diam. at widest point, glabrous outside, throat with ca. 2.5 mm wide band of pale trichomes 0.3–0.5 mm at apex, lobes 7.8–8 × ca. 2 mm, ciliate; anthers dorsifixed on straight filaments ca. 0.7 mm attached at base of corolla lobes, thecae ca. 7.5 × 0.5–0.7 mm, sterile apex ca. 0.5 mm, sterile tails ca. 0.25 mm; ovary thick-walled, 2-locular with slight false septum in upper part partially dividing ovary into 4 pseudolocules, placentas attached to upper half of septum, ovules ca. 60, embedded in

Figure 2. *Aidia crassifolia* S. E. Dawson & Gereau. —A. Leafy branch. —B. Fruiting shoot. —C. Flower. —D. Open flower. —E. Back of anther. —F. Ovary and calyx, longitudinal section. —G. Cross section of upper ovary. —H. Fruit. —I. Seed. —J. Stipule. —K. Domatium in secondary vein axil on abaxial leaf surface. A, H–J from *C. J. Kayombo & M. A. Mwangoka 1456* (K); B–G from *M. A. Mwangoka & E. Nyenga 1196* (K); K from *E. B. Mhoro UMBCP 374* (K).

fleshy placental matrix; disk domed; style ca. 17.5 mm, pollen presenter ca. 11 mm, slightly bifid at apex. Fruit globose-obovoid, 7–7.5 × 7–7.5 mm, drying black; calyx limb deciduous leaving pale corky scar; seeds angular, ca. 1.5 × 1.2 mm, golden brown when dry, finely striate.

Distribution and habitat. *Aidia crassifolia* is known from eastern Tanzania in evergreen lowland moist forest, at 150–1000 m elevation.

Phenology. *Aidia crassifolia* was observed in flower in February, with fruiting observed in February, August, and November.

IUCN Red List category. With GIS mapping of specimen localities (see specimen citations and distribution map at <www.tropicos.org/name/50322856>), we calculate an extent of occurrence (EOO) of 90.7 km^2 and an area of occupancy (AOO) of just under 20 km^2 using a cell size of 3.16 km. Using IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2001), with an EOO of < 5000 km^2, an AOO of < 500 km^2, not more than five locations, and a continuing decline in extent and quality of habitat due to tree cutting and forest conversion to agriculture at least in the Uluguru lowlands of Milawilila Forest Reserve, we assign this species the IUCN Red List Category of Endangered, EN B1ab(iii)+2ab(iii).

Discussion. The specific epithet of the new species refers to its leaf texture, which is significantly thicker than that of the other East African species. It can also be distinguished from the other species of *Aidia* in East Africa by the other characters indicated in the key.

Paratypes. TANZANIA. **Tanga Region:** Korogwe Distr., Ambangulu Tea Estate, N of Ambangulu Tea Factory, E of rd. to Makweli and Mlalo villages, montane forest patch betw. Tea Plantation on steep slope facing NW, 05°03′50″S, 38°26′07″E, 1000 m, 8 Nov. 1998 (fr.), *C. J. Kayombo & M. A. Mwangoka 1456* (K, MO). **Morogoro Region:** Morogoro Rural Distr., Milawilila Forest Reserve, 06°59′S, 37°45′E, 150 m, 21 Aug. 2000 (fr.), *E. B. Mhoro UMBCP 374* (C, DSM, K, MO).

Polysphaeria

Polysphaeria Hook. f. (Rubiaceae, Octotropideae; Robbrecht, 1993) is a genus of 20 species of shrubs and small trees of Africa, Madagascar, and the Comoro Islands (Verdcourt, 1980; Govaerts et al., 2009). It is distinguished by interpetiolar stipules not fused around the stem, congested-cymose to glomerulate inflorescences with well-developed bracts and bracteoles produced in both axils of leaf-bearing nodes, hermaphroditic 4- or 5-merous flowers, corolla lobes convolute in bud, anthers dorsifixed below middle on very short filaments, 2-locular ovaries with the ovules solitary and pendulous on apical placentas in each locule, baccate fruits with one or two seeds, and a conspicuously ruminate endosperm. The bracts and bracteoles of the inflorescence are well developed and numerous, and enclose individual flowers and also groups of flowers.

Verdcourt (1988b) reported seven species of *Polysphaeria* from Tanzania and Kenya, plus *Polysphaeria* sp. A and *Polysphaeria* sp. B, which were incompletely known and could not be named or fully described there. Recent botanical exploration has documented the second of these putative species, which is newly described below.

1. **Polysphaeria ntemii** S. E. Dawson & Gereau, sp. nov. TYPE: Tanzania. Tanga Region: Muheza Distr., Maramba Division, Kwamtili Cocoa Plantation, Kwamngumi Forest Reserve, 4°57′00″S, 38°43′40″E, 150 m, 4 Nov. 1999 (fl., fr.), *A. Ntemi Sallu & C. J. Kayombo 347* (holotype, K; isotypes, BR, M, MO, NHT, UPS). Figure 3.

Haec species quoad folia satis grandia venis secundariis 7- ad 11-jugatis, bracteas bracteolasque extus pubescentes et fructum 1–1.4 cm longum *Polysphaeriae macranthae* Brenan similis, sed ab ea habitu fruticis arbusculaeve usque ad 3 m altae, inflorescentia 10- ad 30-flora atque praecipue calyce corollaque multo minoribus distinguitur.

Treelet or shrub 1.5–3 m tall, DBH not recorded; red resin or sap visible in many organs as fine dots on surface giving speckled appearance; lateral branches arising from main stem above nodes, straight, terete, 2–5 mm diam., glabrous; young shoots somewhat shining, smooth, with bark light brown to pale gray, flaky when mature; internodes 1.2–9.5 cm. Stipules connate at base, triangular, keeled, ca. 5 × 5 mm, outer surface smooth, inner surface with thick colleters, falling to leave a pale corky scar with thick colleters and pale trichomes at base, apex aristate, ca. 0.9 mm, smooth, drying black, margins pale, chartaceous, ciliate; petiole 5–10 × 1.2–2 mm, laterally impressed and channeled, rough at base, articulated, drying dark brown, glabrous; leaf lamina oblong, ovate-oblong, or elliptic, 9–19 × 4.5–8.6 cm, sometimes those below lateral branches or at lower nodes broadly ovate and 2.7–3 × 2–3.6 cm, thinly coriaceous, drying gray-brown to gray-green, dull or with a slight sheen on both surfaces, glabrous, apex acuminate with acumen sometimes slightly emarginate, base obtuse to broadly cuneate to more usually rounded or truncate; midrib depressed adaxially; venation weakly brochidodromous with secondary veins 7 to 11 pairs, ascending at angle of 60°–75°, evenly spaced, joining to form looped submarginal

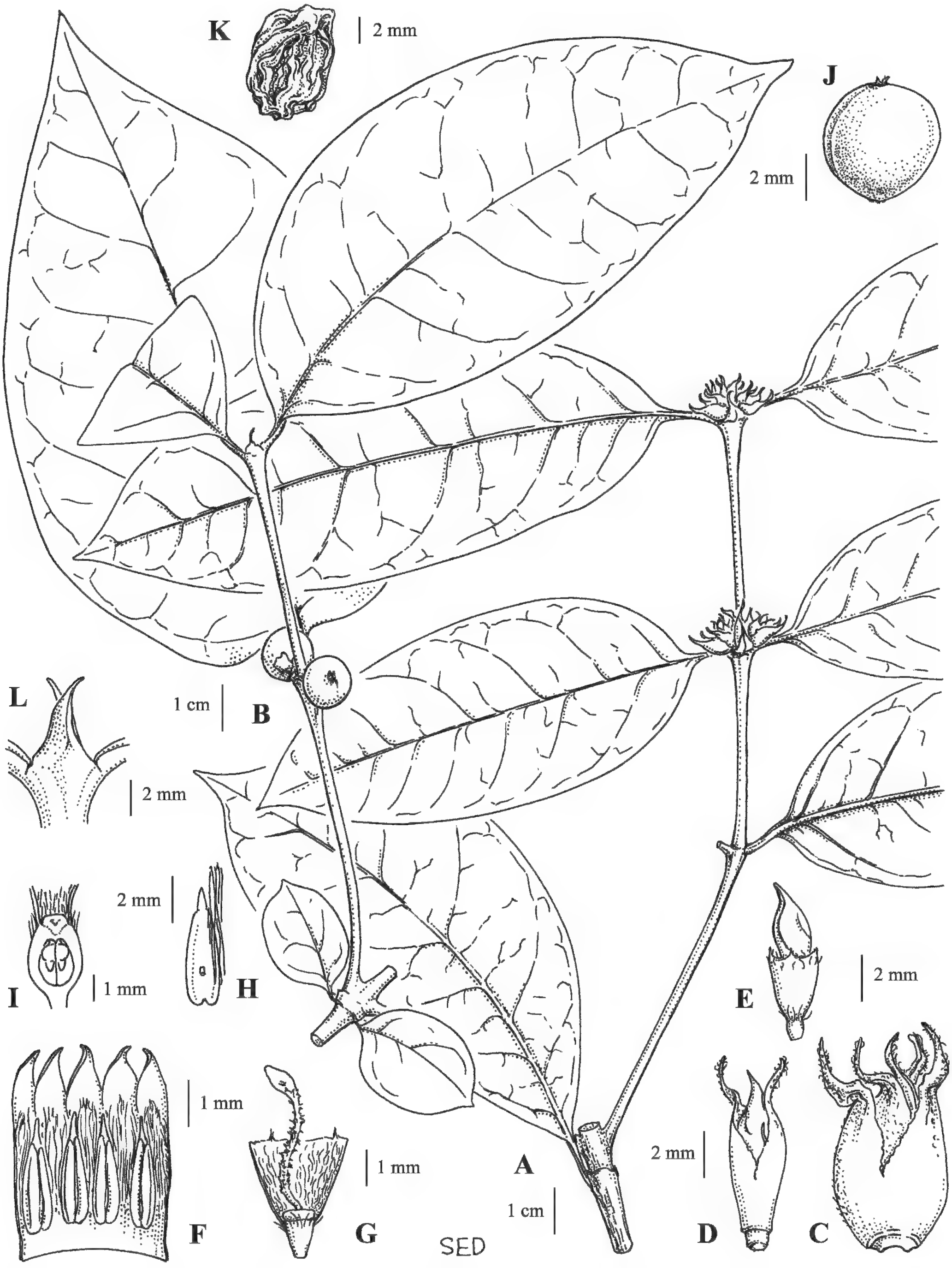

Figure 3. *Polysphaeria ntemii* S. E. Dawson & Gereau. —A. Flowering branch. —B. Fruiting branch. —C. Bracteoles surrounding bud. —D. Bracteole and bud. —E. Intact bud. —F. Bud dissected open. —G. Calyx and style. —H. Anther and trichomes, dorsal view. —I. Ovary, longitudinal section. —J. Fruit. —K. Seed. —L. Stipule. A from *M. A. Mwangoka & A. Maingo 1281* (K); B, K, L from *A. Peter 25237* (K); C–J from *A. Ntemi Sallu & C. J. Kayombo 347* (K).

vein 2–5 mm from margin; tertiary and higher-order veins visible on both surfaces; domatia lacking. Inflorescence congested, glomerulate, 10- to 30-flowered, 9–11 × 7–10 mm, with flowers in triads, each flower surrounded by 2 bracteoles one within the other splitting from apex by enlargement of flower bud; bracts and bracteoles 4–9 mm, conical in bud, apex extended into 2(or 3) aristate lobes 0.7–2 mm, chartaceous, fragile and often broken on dried specimens, ferrugineous, outer surface with scattered pale trichomes, particularly pubescent on lobes, inner surface covered with long pale trichomes growing toward apex, both surfaces with dark trichomes and sometimes thick colleters along upper margin, line of attachment at base pale and corky; pedicels ca. 0.3 mm, glabrous. Flower with hypanthium turbinate, ca. 3.5 × 0.8 mm, black-brown, with pale trichomes around base and apex; calyx limb cupular, 2–2.2 × ca. 2 mm, chartaceous, ferrugineous, with few scattered trichomes outside, inner surface covered by white trichomes 0.2–0.4 mm growing toward apex, lobes 0.1–0.3 mm, triangular, pubescent and translucent at margin, becoming distinctly lobed and thickened as fruit matures; corolla only seen in bud, 5–5.3 × ca. 1.5 mm, white, drying black, glabrous, tube slightly funnel-shaped, ca. 2.5 mm, glabrous outside, inside with a dense matted flattened band ca. 2.5 mm wide of ferrugineous trichomes 0.4–2.5 mm long at throat adhering to each anther connective, lobes forming a slender point in bud, 2–2.2 × ca. 1 mm, margins chartaceous; filaments ca. 0.1 mm, inserted at base of corolla lobes; anthers 2.2–2.5 mm, thecae 0.8–2 mm, sterile apex 0.3–0.4 mm; ovary disk a raised ring; style exserted, ca. 2 cm, covered with matted, flattened, ferrugineous trichomes ca. 0.1 mm inside bud, glabrescent and exserted when mature; stigmatic lobes ca. 2 mm. *Fruit* subglobose, 1–1.4 cm long and in diam., red when fresh, brown when dry, dull, with a few trichomes on remains of calyx; seeds 2, plano-convex to hemispherical, 7–8 mm diam., brown when dry, sulcate, strongly striate.

Distribution and habitat. *Polysphaeria ntemii* is known from the East Usambara lowlands of Tanzania in evergreen lowland dry to moist forest, at 100–320 m elevation.

Phenology. *Polysphaeria ntemii* was observed in flower in November, with fruiting observed from July to November.

IUCN Red List category. With post facto georeferencing of historic specimens (*Peter 25227, 25237*) and GIS mapping of specimen localities (see specimen citations and distribution map at <http://www.tropicos.org/name/100351324>), we calculate an extent of occurrence (EOO) of < 80 km² and an area of occupancy (AOO) of just under 50 km² using a cell size of 3.16 km. Using IUCN Red List Categories and Criteria Version 3.1 (IUCN, 2001), with an EOO of < 5000 km², an AOO of < 500 km², not more than five locations, and a continuing decline in extent and quality of habitat due to tree cutting and forest conversion to agriculture in the East Usambara lowlands, we assign this species the IUCN Red List Category of Endangered, EN B1ab(iii)+2ab(iii).

Discussion. This new species corresponds to "*Polysphaeria* sp. B" of Verdcourt (1980: 115, 1988b: 578) and Iversen (1991: 207). In his key, Verdcourt (1988b: 570) distinguished it from *P. macrantha* Brenan by its smaller calyx and corolla. The specific epithet honors the collector of the type, Albert Ntemi Sallu, who was employed at the time by the East Usambara Catchment Forest Project. *Polysphaeria ntemii* and *P. macrantha* are similar in having relatively large leaves with seven to 11 secondary veins, bracts and bracteoles pubescent outside, and large fruits (for *Polysphaeria*) 1–1.4 cm long. However, *P. macrantha* differs from the new species in being a larger tree to 10 m high, its small, 2- to 4-flowered inflorescences, and especially in its much larger calyx with limb 7–13 mm long and corolla with tube 10–11 mm long and lobes about 12 mm long. Furthermore, *P. macrantha* is a species of moist lower to middle montane forest at altitudes of 910–2105 m in the Eastern Arc Mountains (South Pare, East Usambara, and Udzungwa; see specimen citations at <www.tropicos.org/name/27909164>), while *P. ntemii* is confined to the East Usambara lowlands.

Paratypes. TANZANIA. **Tanga Region:** Muheza Distr., Kwamtili, 300 m, 3 Oct. 1918 (fr.), *A. Peter 25227* (K, MO), *25237* (K); Mtai Forest Reserve, 4 Sep. 1996 (fr.), *Kisena 1633* (K, TFD); Kwemnyese public forest patch (Kwamtili), in Kuze Kibago Village, 4°54′52″S, 38°43′34″E, 100 m, 24 May 2000 (young fr.), *M. A. Mwangoka & A. Maingo 1281* (BR, K, MO, NHT, UPS); Kwamngumi W., 4°56′S, 38°45′E, 24 July 2001 (fr.), *W. R. Q. Luke, I. Rajabu, S. Chidzinga, C. Muir & B. Lyte 7521* (EA, K, NHT, Ukunda); Misozwe Village, Mlinga Forest Reserve, dry lowland forest, 05°04′S, 38°47′E, 320 m, 18 Oct. 2001 (fr.), *A. Ntemi Sallu 795* (BR, K, MO, NHT, RAB, UPS).

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Bornmuellerantha alshehbaziana (Orobanchaceae), a New Species from Turkey

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ABSTRACT. *Bornmuellerantha alshehbaziana* Dönmez & Mutlu (Orobanchaceae), a hemiparasitic plant from Çiğdem Mountain, Antalya Province, Turkey, is described and illustrated. It is the second species in the previously monospecific *Bornmuellerantha* Rothm. Morphological comparison and distinguishing characters are given. The new species is a smaller plant, has smaller flowers, and is found on high mountain slopes, in comparison to the generitype, *B. aucheri* (Boiss.) Rothm. *Bornmuellerantha alshehbaziana* is also contrasted with species of the related genus *Odontites* Ludw. The IUCN Red List category of Critically Endangered (CR) is proposed for the new species.

Key words: *Bornmuellerantha*, IUCN Red List, *Odontites*, Orobanchaceae, Scrophulariaceae, Turkey.

Plants of an undescribed species of *Bornmuellerantha* Rothm. (Orobanchaceae) were collected from the rocky slopes of Çiğdem Mountain, from Antalya Province, Turkey, during ongoing floristic research in that region. The local habitat is unusual for *Bornmuellerantha*, which is known from more humid areas. Although the identification key in the *Flora of Turkey and the East Aegean Islands* (Hedge, 1978) initially led to *Odontites aucheri* Boiss., the newly collected material exhibited characters clearly distinct from those given in the description of that species. After consulting other floristic works (Webb & Camarasa, 1972; Hedge, 1978; Pignatti, 1982), the specimen was tentatively identified as *O. corsicus* (Loisel.) G. Don, although the characters of the new plants did not quite match those of this species either.

Rothmaler (1943) segregated the genus *Bornmuellerantha* from *Odontites* Ludw. (Orobanchaceae). Recent monographic and molecular studies on the Scrophulariaceae s.l. (e.g., Bolliger, 1996; Stevens, 2001; Fischer, 2002; APG, 2003; Albach et al., 2005; Tank et al., 2006) have led to the assignment of both genera diversely from the Scrophulariaceae s. str., Plantaginaceae, and Orobanchaceae. Both *Odontites* and *Bornmuellerantha* have transferred from the Scrophulariaceae s.l. to the expanded families Orobanchaceae and Plantaginaceae (Olmstead et al., 2001; Wolfe et al., 2005). The APG (2003) and Stevens (2001) incorporated these new findings, and this resulting classification is therefore followed herein.

Bornmuellerantha alshehbaziana Dönmez & Mutlu, sp. nov. TYPE: Turkey. Antalya: Gazipaşa, Kaş pasture, above *Pinus nigra* forest, high mtn. steppe, limestone, 36°28′859″N, 032°25′697″E, 1760 m, 23 Sep. 2006, *Ali A. Dönmez 14036 & Birol Mutlu* (holotype, HUB; isotypes, E, INU, MO). Figure 1.

Haec species a *Bornmuellerantha aucheri* (Boiss.) Rothm. habitu humiliore, foliis brevioribus angustioribus, calyce breviore ac parum latiore, corolla breviore ad faucem angustiore, capsula aliquantum breviore atque seminibus longioribus angustioribus distinguitur.

Annual, erect plants (2–)4–7(–10) cm tall; stems retrorsely strigose, lower branches arcuate to ascending or horizontal. Cauline leaves 6–10 × 0.5–0.6 mm, linear to narrowly lanceolate, obtuse, antrorsely strigose. Inflorescences 1–3 cm; bracts 4–6 mm, linear-lanceolate, shorter than calyx, widened at base; pedicels 1–2 mm. Calyx 4–6 × 1.5–2 mm, widely campanulate, glandular and eglandular strigose; teeth triangular, acute, villose inside. Corolla 5–6 mm, yellow, pubescent outside especially on lips, 4–5 mm diam.; anthers glabrous, included, 1–1.4 mm. Capsule 5–6.2 × 2.5–3.6 mm, equal or slightly longer than calyx, obovate, truncate or slightly emarginate, pubescent; seeds oblong, 1.5–1.8 × 0.4–0.6 mm.

Distribution and habitat. *Bornmuellerantha alshehbaziana* is known from Antalya Province, Turkey, and is considered an endemic Mediterranean element of the flora. It is found in high mountain steppes and dry limestone slopes, from pastures above forests of *Pinus nigra* Arnold.

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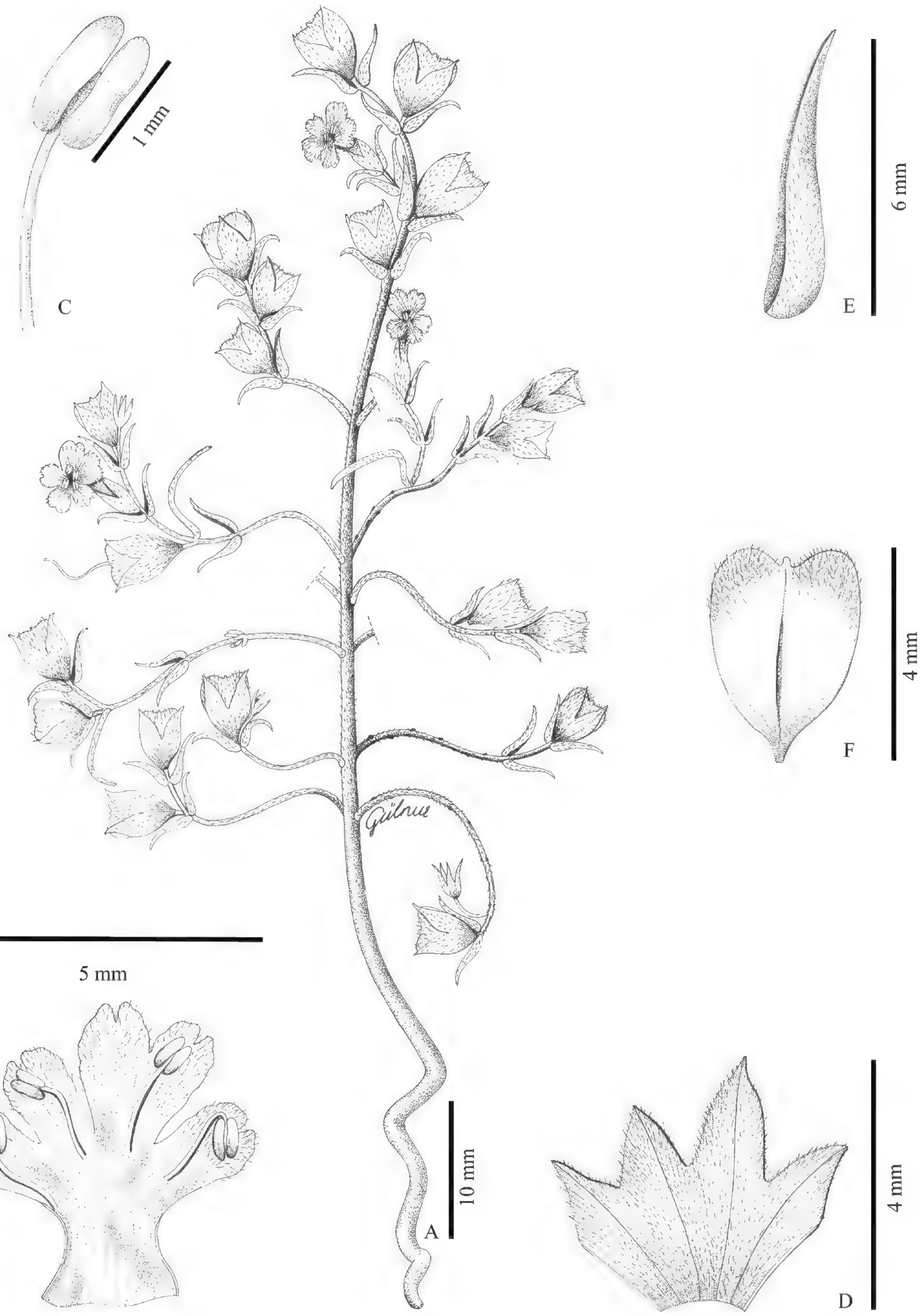

Figure 1. *Bornmuellerantha alshehbaziana* Dönmez & Mutlu. —A. Fertile plant. —B. Dissected corolla. —C. Stamen. —D. Dissected calyx (one of the five teeth removed). —E. Bract. —F. Capsule. Drawn from the holotype *A. Dönmez 14036 & B. Mutlu* (HUB).

IUCN Red List category. *Bornmuellerantha alshehbaziana* is known from two adjacent localities in Antalya Province, Turkey. The population at the type locality consists of approximately 50 individuals, but the population size at the paratype locality was not estimated. Due to the high endemism in the floristically rich Taurus mountain ranges (Turkey), further botanical expeditions may lead to the

discovery of additional populations for the new species. Based on our field observations in the area, there is no immediate threat for the population of this species. Following IUCN Red List criteria (IUCN, 2001), we assess *B. alshehbaziana* as Critically Endangered (CR B2b[i,v]; D), with an extent of occurrence less than 100 km^2 and population size estimated to number fewer than 50 mature individuals.

Phenology. *Bornmuellerantha alshehbaziana* was observed to flower from July through September, with fruits collected in September.

Etymology. *Bornmuellerantha alshehbaziana* is named in honor of one of the associate researchers on the project, Ihsan A. Al-Shehbaz (1939–), of the Missouri Botanical Garden.

Discussion. Rothmaler (1943) proposed *Bornmuellerantha* as a monospecific segregate genus based on *Odontites aucheri* [≡ *B. aucheri* (Boiss.) Rothm.]. However, this taxonomic segregation was not accepted by subsequent authors on the family Scrophulariaceae (e.g., Webb & Camarasa, 1972; Hedge, 1978; Pignatti, 1982). A recent monographic study by Bolliger (1996) accepted *Bornmuellerantha* as a genus distinct from *Odontites* based on morphological, palynological, and biogeographical data.

Bornmuellerantha alshehbaziana is the second species in the genus, and it differs from the generitype, *B. aucheri*, in both habitat and morphology. The new species usually thrives in dry areas of high mountain slopes, compared to *B. aucheri*, which mostly prefers wet meadows or lower-altitude steppes. *Bornmuellerantha aucheri* also grows in neighboring Iran, and it appears that Turkey is the center of diversity for the genus.

Bornmuellerantha alshehbaziana can be distinguished from *B. aucheri* by its smaller plants ([2–]4–7[–10] cm vs. 8–35[–45] cm tall) that have shorter and narrower leaves (6–10 × 0.5–0.6 mm vs. 12–27 × 1–2.6 mm), a shorter and slightly broader calyx (4–6 × 1.5–2 mm vs. 5.5–10 × 1.2–1.5 mm), a shorter corolla (5–6 mm vs. 7.5–10.5 mm) with a narrower throat (4–5 mm vs. 6.2–7.3 mm diam.), slightly smaller capsules (5–6.2 mm vs. 6–9 mm long), and seeds that are longer (1.5–1.8 mm vs. 1.4–1.6 mm) and narrower (0.4–0.6 mm vs. 0.7–0.9 mm) with a larger length:width ratio (3.24:1 vs. 1.88:1).

Paratype. TURKEY. **Antalya:** Sugözü village, Akçal Mtn., 2000 m, 7 Sep. 1983, *H. Sümbül 2393* (HUB).

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New and Critical Taxa of *Rubia* and *Galium* (Rubiaceae, Rubieae) for the *Flora of China*

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Abstract. On the basis of extensive herbarium studies, *Rubia pseudogalium* Ehrend., *Galium chekiangense* Ehrend., *G. kunmingense* Ehrend., *G. rupifragum* Ehrend., and *G. sichuanense* Ehrend. are described, illustrated, and discussed as new species from Zhejiang (= Chekiang), Yunnan, and Sichuan, respectively, for the flora of eastern and southwestern China. *Galium dahuricum* var. *densiflorum* (Cufod.) Ehrend. is a new combination.

Key words: *Flora of China*, *Galium*, IUCN Red List, *Rubia*, Rubiaceae, Rubieae.

This article has emerged from extensive herbarium studies and text preparation concerning the genera of the Rubieae tribe for the forthcoming Rubiaceae volume (19) of the *Flora of China*. It includes descriptions, discussions, and photographs of new taxa: one species of *Rubia* L. and four species and a new varietal combination of *Galium* L. From DNA-based analytical studies (Natali et al., 1996, unpublished), it has become clear that *Rubia* (together with the small Mexican genus *Didymaea* Hook. f.) occupies a relatively basal and plesiomorphic position within the tribe. The genus *Rubia* is well separated, clearly monophyletic, has only about 80 species, and is limited to Eurasia and Africa. In contrast, in its present provisional classification, the more apomorphic genus *Galium* is difficult to circumscribe and clearly polyphyletic. It includes more than 600 species with a worldwide distribution and is the largest genus of the tribe. For a survey of the present status of Rubieae systematics, differential characters of genera and sections, as well as keys, see Ehrendorfer et al. (2005).

New Species in *Rubia*

1. Rubia pseudogalium Ehrend., sp. nov. TYPE: China. Yunnan: Gaoligong Shan region, Tengchong Xian, Wuhe Xiang, ridge S of pass at top of Gaoligong Shan on old rd. from Baoshan to Tengchong via Dahaoping, W side of Gaolingong Shan, 2525 m, W-facing 0°–10° slope, 24°54′40″N, 98°45′25″E, bamboo mixed w/ broadleaf evergreen trees and shrubs, vine climbing through bamboo, loam on decomposed granite, 5 Sep. 2003, *Gaoligong Shan Biodiversity Survey 18832* (holotype, WU; isotypes, CAS, KUN). Figure 1.

Haec species habitu speciebus generis *Galii* L. similis, ex affinitate *Rubiae truppelianae* Loes., ab ea foliis usque ad 4-nis tantum verticillatis, petiolis non longioribus quam 6 mm (nec 6–40 mm), pedunculis brevioribus 3–6 mm (nec 10–40 mm) longis, inflorescentiis semper lateralibus atque lobis corollae 1.2–1.5 mm (nec ca. 2 mm) attingentibus differt.

Sprawling or twining herbs, to 2 m; *stems* branched, quadrangular, glabrous and smooth or sparsely retrorsely aculeolate. *Leaves* and leaflike stipules in whorls of never more than 4; petioles (1–)2–4(–6) mm; blades drying blackened, subleathery, abaxial surface somewhat brighter than adaxial surface, linear-lanceolate, lanceolate, or lanceolate-oblong, often somewhat falcate, 20–40 × 2–8 mm, length/width index 4–10, apex acute or shortly acuminate, margin and midvein adaxially somewhat retrorsely aculeolate or smooth, base cuneate to acute; principal vein 1, the 2 basal lateral veins very weak, but extending beyond half of the leaf length, often hardly visible. *Inflorescences* axillary, thyrsoid, somewhat narrowly elongate, many (at least 5)-flowered, glabrous; peduncles 3–6 mm; bracts small, linear-lanceolate, 0.5–3 mm; pedicels 1–6 mm. *Flower* with the *ovary* inferior (hypanthium), obovoid, ca. 0.8 mm; *corolla* rotate, yellowish green, white, or purple, lobes 5, ovate-triangular, 1.2–1.5 mm, shortly acuminate. *Berry* didymous, blackened, subglobose, 3–5 mm diam.

Distribution and habitat. *Rubia pseudogalium* is known from subtropical, montane, evergreen, broadleaf forests from Yunnan Province, China, in the Gaoligong Shan region, at altitudes of 2400–3000 m.

IUCN Red List category. According to the many specimens seen from the Gaoligong Shan region, *Rubia pseudogalium* can be placed in the IUCN Red List category Least Concern (LC; IUCN, 2001) as long as natural protection is maintained in the region.

Phenology. The new species was noted to flower from May to June and to fruit from July to August.

Figure 1. *Rubia pseudogalium* Ehrend. The plant above is the holotype (*Gaoligong Shan Biodiv. Survey 18832*, WU); the lower is one of the paratypes (*Gaoligong Shan Biodiv. Survey 29168*, WU). Scale bar = 10 cm.

Discussion. *Rubia pseudogalium* is quite similar in habit to several species of *Galium* and has been mistaken for that genus. However, its regularly 5-merous flowers and berrylike fruits clearly place it in *Rubia*, where it appears to be related to *R. truppeliana* Loes. (Loesener, 1919: 183), described from the mountains of Shandong Province in northeastern China. The main differences that distinguish *R. pseudogalium*

are the leaf whorls with never more than four elements (vs. six to eight in *R. truppeliana*), the leaf petioles always shorter than 6 mm (vs. 6–40 mm), the peduncle length 3–6 mm (vs. 10–40 mm), the exclusively lateral (never terminal) inflorescences, and the smaller flowers with lobes only 1.2–1.5 mm (vs. ca. 2 mm). There is remarkable variation in leaf shape (cf. Fig. 1) and flower color, as documented by the numerous paratype specimens available from the Gaoligong Shan region, where *R. pseudogalium* may be endemic.

Paratypes. CHINA. **Yunnan:** Gaoligong Shan region, various localities near Tengchong (Te), Longyang Qu (Lo) & Lushui Xian (Lu), *Gaoligong Shan Biodiversity Survey 23837* (Lo), *24251* (Lu), *25172* (Te), *29168* (Te), *29209* (Te), *29217* (Te), *30132* (Te) (all at CAS, WU).

New Species in *Galium*

1. Galium chekiangense Ehrend., sp. nov. TYPE: China. Chekiang [Zhejiang]: Xi ming shan, s.d., *s. coll. 0830* (holotype, PE [2]). Figure 2.

Haec species ex afffinitate *Galii kamtschatici* Steller ex Schult. et *G. nakaii* Kudô ex Hara, ab eis foliis in sicco clare brunneolo-viridibus subcoriaceis in superficie papillosis (nec membranaceis laevibusque), in pagina inferiore glandulosostriatis (nec striis deficientibus) atque mericarpiis trichomatibus brevissimis (0.15–0.25 mm) curvatis (nec 0.8–1 mm uncinatis) vestitis differt.

Perennial herbs, with thin rhizomes and 2 to 4 erect stems from a common base, 20–30(–40) cm tall, with only 4 to 5 internodes from the base to the first inflorescence node, with 4 prominent, rounded and whitish angles, glabrous and smooth except for short and stiff hairs at the nodes. *Leaves* and leaflike stipules in whorls of 4, broadly elliptic to ovate, (15–)23–30 (–50) × (8–)11–15(–25) mm, drying somewhat leathery and light brownish green, subsessile, gradually narrowed into the base, broadest near the middle, mostly short-apiculate but without a hyaline point, glabrous except for antrorse microhairs (0.1–0.2 mm) along the 3 main veins, mostly on the abaxial but also on the adaxial surface and along the slightly revolute margins, papillose adaxially under a strong lens (×15), abaxial surface clearly marked by numerous darker and linear idioblasts. *Inflorescences* loosely thyrsoid and elongate, from uppermost 2 to 3 nodes, clearly longer than subtending leaves, the cymes lateral and terminal, somewhat divaricate, 1–4 cm, with few and inconspicuous linear bracts, peduncles ca. 1–2 cm, pedicels 0.1–1 cm. *Flowers* ca. 3 mm diam., white, rotate, with 4 acuminate lobes. *Mericarps* ovoid, 1.5–2(–3?) mm, densely covered by stiff and slightly divergent microhairs of 0.15–0.25 mm with an acute and ± bent apex.

Distribution and habitat. *Galium chekiangense* is probably endemic in southeastern China from Zhejiang (= Chekiang and Fujian), where it is known to grow in lower montane forests at ca. 1400 m elevation.

IUCN Red List category. *Galium chekiangense* is assessed as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Phenology. *Galium chekiangense* apparently flowers in July and fruits in August.

Discussion. *Galium chekiangense* clearly belongs to *Galium* sect. *Platygalium* W. D. J. Koch s.l. (Ehrendorfer et al., 2005) and apparently is a member of the *G. kamtschaticum* species group. This group includes the amphi-Beringian *G. kamtschaticum* Steller ex Schult., which in China is limited to altitudes of 1500–2300 m in the northeastern provinces of Heilongjiang and Jilin, the Japanese *G. nakaii* Kudô ex Hara from Hokkaido and northern Honshu, and the western North American *G. oreganum* Britton. These three latter species differ from *G. chekiangense* by their leaf blades drying dark brownish (not light brownish green), thin, membranous and smooth, neither papillose adaxially nor with glandular-striate idioblasts abaxially, and by their much longer uncinate trichomes (0.8–1 mm vs. 0.15–0.25 mm) on the ripe mericarps. In addition, *G. nakaii* has inflorescences with cymes that are mostly shorter (not clearly longer) than the subtending leaves.

Representatives of *Galium chekiangense* from the province of Fujian were included and described in *Flora Reipublicae Popularis Sinicae* (Chen, 1999) under the name of *G. nakaii* Kudô ex Hara. Relevant Fujian vouchers were not available to me, but I have seen two fruiting specimens in the PE herbarium from the adjacent province of Zhejiang (formerly Chekiang) determined as *G. kamtschaticum*, which closely correspond to the description of *G. nakaii* in Chen (1999). These PE specimens deviate so clearly from authentic Japanese specimens of *G. nakaii*, as well as from *G. kamtschaticum* and *G. oreganum*, that their description as a new species appears obligatory. For the above diagnosis, the flower characters were taken from Chen (1999) because the type specimens from PE are in fruit.

For further and more detailed studies of the *Galium kamtschaticum* species group, one should refer to the wide circumscription of *G. kamtschaticum* (with three varieties) and the confused, partly contradictory description of the fruit indumentum of *G. nakaii* in Yamazaki (1993).

2. Galium kunmingense Ehrend., sp. nov. TYPE: China. Yunnan: Kunming, above Su-Chia-Chuen, Hei-Shan, 1950 m, 2 July 1945, *T. N. Liou 13776* (holotype, PE). Figure 3.

Figure 2. *Galium chekiangense* Ehrend. Holotype (*s. coll. 0830*, PE), with close-up of inflorescence and young fruits inset at top left. Scale bar = 10 cm.

Haec species inter congeneros ad *Galium* sect. *Platygalium* W. D. J. Koch pertinentes quoad corollam in dimidio basali connatam *G. platygalio* (Maxim.) Pobed. et *G. maximowiczii* (Kom.) Pobed. similis, sed ab eis floribus minoribus atque foliis 4-nis tantum verticillatis differt.

Perennial herbs, erect, (12–)15–20(–25) cm; *stems* with 4 prominent rounded angles, with scattered upward (or sometimes also downward), curved short hairs, these more dense at nodes; internodes 1.5–4 cm

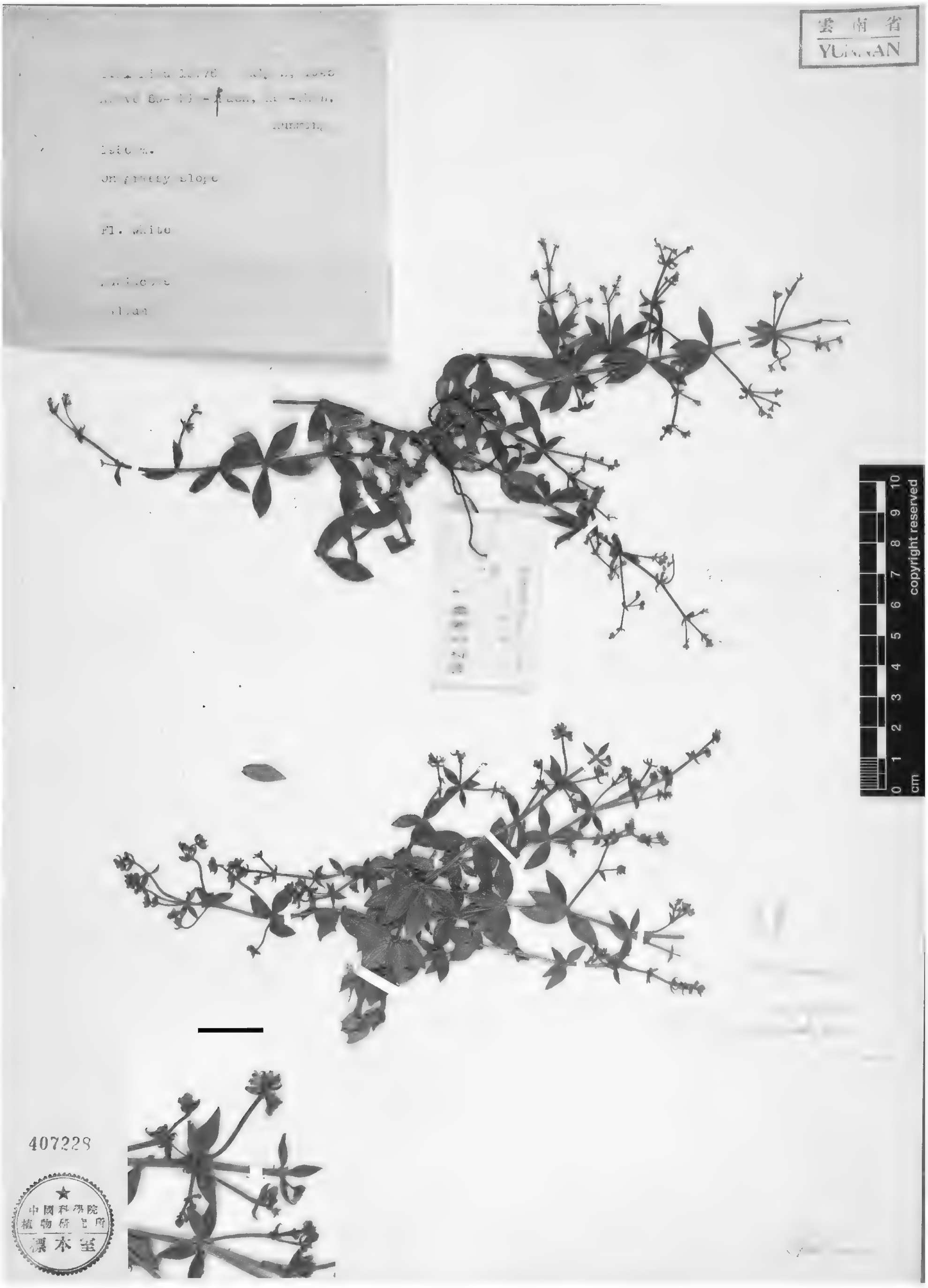

Figure 3. *Galium kunmingense* Ehrend. Holotype (*T. N. Liou 13776*, PE), with close-up of inflorescence and flowers inset at bottom left. Scale bar = 10 cm.

at middle stem regions, longer or somewhat shorter than leaves. *Leaves* and leaflike stipules in whorls of 4, drying ± leathery and dark brownish, broadly lanceolate, (10–)15–25(–35) × (4.5–)6–7.5(–9) mm, length/width index (2–)2.5–3.5(–4), glabrous, apex acute but not acuminate, margins revolute and antrorsely aculeolate, base cuneate; adaxial surface papillose, abaxial surface without glandular idioblasts;

principal veins 3, prominent and extending into the apex region. *Inflorescences* pyramidal, with cymes terminal and in middle to upper stem nodes, axes glabrous, somewhat divaricate; cymes several- to many-flowered, peduncles mostly 1.5–4 cm, pedicels (0.5–) 1–5 mm; bracts lanceolate, small and inconspicuous. *Flowers* hermaphrodite (always?); *ovary* obovoid, ca. 0.5 mm, glabrous, smooth; *corolla* white to greenish, cup-shaped or campanulate, (2–)2.3–2.5(–2.7) mm diam., fused at the base (i.e., tube) for about the length of the 4 free lobes, these 0.8–1 mm long, lanceolate, acute but not apiculate. *Mericarps* separate, ovoid, ca. 1.5–3 mm, glabrous and ± smooth.

Distribution and habitat. *Galium kunmingense* apparently is endemic to Yunnan Province and has not yet been found outside the Kunming area. It grows on open grassy or rocky slopes at altitudes of 1950–2500 m.

IUCN Red List category. *Galium kunmingense* apparently has not been collected since 1945, and its habitats around Kunming perhaps are now more or less destroyed. Therefore, its conservation assessment could correspond to the IUCN Red List category Endangered (EN; IUCN, 2001) or worse.

Phenology. *Galium kunmingense* was noted to flower from June to August and to fruit from July to September.

Discussion. It is remarkable that *Galium kunmingense*, a quite conspicuous species, has remained unnoticed up to now. It clearly belongs to *Galium* sect. *Platygalium* s.l. (Ehrendorfer et al., 2005). In addition to our new taxon, this section includes several other species with corollas basally fused to about half their length. One of these, traditionally still maintained as a separate genus, is *Microphysa elongata* (Schrenk) Pobed., which is found from Kazakhstan to Xinjiang in western China. It differs from *G. kunmingense* by its leaves with only one main vein and by a somewhat inflated fruit pericarp, including both parts of the ripening ovary. Two other members of *Galium* sect. *Platygalium* with similar corollas were formerly regarded as species of *Asperula* L.: *G. platygalium* (Maxim.) Pobed. and *G. maximowiczii* (Kom.) Pobed. These species are distributed from eastern Siberia and Korea to northeastern China and differ from *G. kunmingense* by their larger flowers (3–5 mm diam.) and by leaf whorls often with more than four (i.e., five to six) elements.

Closer relationships can be assumed between *Galium kunmingense* and some other eastern Asiatic species of *Galium* sect. *Platygalium* s.l. with rotate corollas. One of these, *G. kinuta* Nakai & H. Hara, also has glabrous fruits, but differs by its narrower leaves that are punctate-striate with glandular idioblasts on the abaxial surface and by its more slender inflorescences with more numerous flowers. Other apparent relatives of *G. kunmingense* with rotate flowers of less than 3 mm diam. have hairy fruits, including *G. hupehense* Pamp. with appressed hooked hairs on the fruits, *G. nakaii*, and particularly *G. yunnanense* H. Hara & C. Y. Wu, both of the latter with spreading, uncinate fruit hairs. *Galium yunnanense* is more or less sympatric with *G. kunmingense*, but has rotate (vs. campanulate or cup-shaped), smaller corollas and uncinate fruit hairs, and its leaves are also more hairy and punctate-striate glandular abaxially. Members of the polymorphic aggregate of *G. boreale* L. and *G. rubioides* L. differ from *G. kunmingense* by their more elongate (not pyramidal) inflorescences and rotate, larger flowers (more than 3 mm diam.).

Paratypes. CHINA. **Yunnan:** Kunming City, Heinongtan [Helongtan], 9 Oct. 1940(?), *S. E. Liu 16789* (PE); Wei-si Hsien, Yeh-Chih, 2500 m, July 1935, *C. W. Wang s.n.* (PE).

3. Galium rupifragum Ehrend., sp. nov. TYPE: China. Yunnan: Ping-pien Hsien, 1500 m, 18 July 1934, *H. T. Tsai 60986* (holotype, PE; isotype, PE). Figure 4.

Haec species quoad habitum gracile atque fructus trichomata uncinata *Galio salwinensi* Hand.-Mazz. ut videtur affinis, sed ab eo foliorum venis principalibus 3 atque caulis internodiis numerosioribus brevioribus distinguitur.

Perennial herbs, densely caespitose, emerging from a slender, branching rootstock; all vegetative parts very fragile when dried and with a loose indumentum of soft hairs 0.5–0.8 mm, ± straight and spreading, on the adaxial leaf surface slightly bent downward; *stems* ascending or erect, 5–10 cm tall, 4-angled, hairy, with 12 to 18 internodes, increasing in length from 2–8 (–15) mm or more upward, with some short vegetative lateral branches produced from the middle region to the inflorescence base. *Leaves* and leaflike stipules in whorls of 4, thinly papery and remaining ± greenish when dried, ovate to broadly lanceolate, 5–8 × 2.5–3.5 mm, base attenuate, apex acute to apiculate, margins flat or slightly revolute, loosely hairy on both sides and marginally; principal veins palmate, 3, the lateral veins weak. *Inflorescences* terminal, mostly with 3 cymes, each with 3 to 5 flowers, bracts few and ± reduced, peduncles 4–5 mm, pedicels 0.5–3 mm, glabrescent, somewhat elongated and divaricate in fruit. *Flowers* hermaphrodite; *ovary* ovoid, ca. 0.5 × 0.3 mm, with hardly developed appressed hairs; *corolla* rotate, greenish white, ca. 1.5 mm diam., with 4 triangular and acute to slightly apiculate lobes. *Mericarps* ca. 0.8–1 mm, with spreading, uncinate trichomes ca. 0.25 mm.

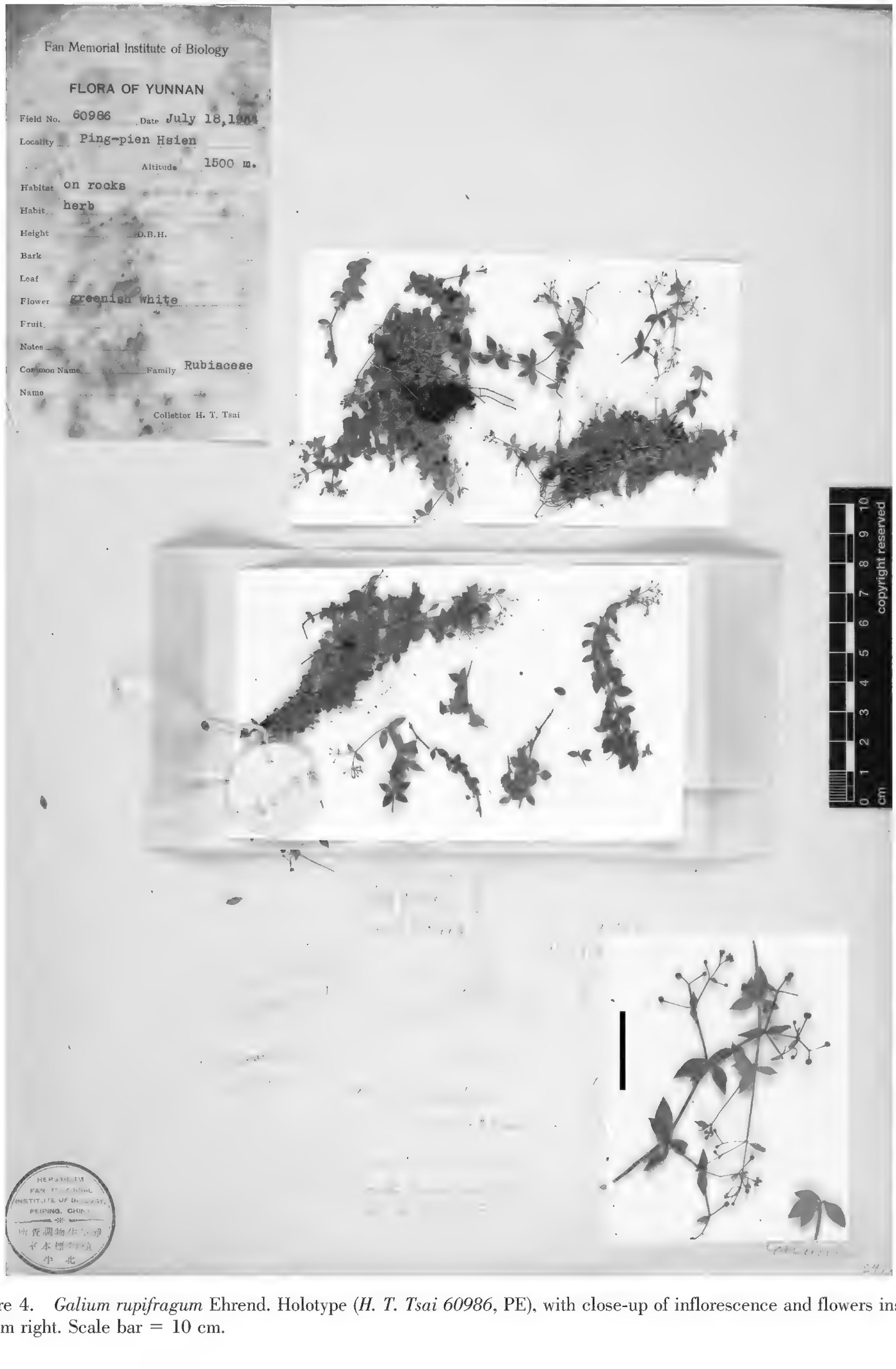

Figure 4. *Galium rupifragum* Ehrend. Holotype (*H. T. Tsai 60986*, PE), with close-up of inflorescence and flowers inset at bottom right. Scale bar = 10 cm.

Distribution and habitat. *Galium rupifragum* is known only from the mountainous type locality in Yunnan Province (Ping-pien Hsien), where it grows on rocks at 1800 m elevation.

IUCN Red List category. In its rocky habitat *Galium rupifragum* may be less vulnerable to human interference, but no further details are known. Thus, its conservation assessment is assessed here as Data

Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

Phenology. According to the type specimen, *Galium rupifragum* appears to flower from June to August and to fruit from July to September.

Discussion. With its perennial growth form, the leaves and leaflike stipules in whorls of never more than four, and its mericarps covered with uncinate trichomes, *Galium rupifragum* is a typical member of *Galium* sect. *Platygalium* s.l. (Ehrendorfer et al., 2005). Affinities apparently exist with the eastern Asiatic *G. bungei* Steud. group, in particular with *G. salwinense* Hand.-Mazz. in southwestern China. *Galium rupifragum* is similar to *G. salwinense* in its slender growth form and uncinate fruit hairs, but in *G. salwinense* the leaves have only a single main vein and there are fewer (only up to 10) and longer (up to 10–20 mm) stem internodes. Nevertheless, on Mt. Omei (in Sichuan Province), typical *G. salwinense* occurs at lower elevations, whereas at higher altitudes its reduced forms somewhat approach *G. rupifragum*. The new species is also similar to species of the *G. morii* group, which comprises five closely related species from the high mountains of Taiwan. Of the species of the *G. morii* group, *G. rupifragum* is particularly close to *G. morii* Hayata itself and the related *G. formosense* Ohwi. *Galium rupifragum* differs from *G. morii* by its hirsute stems and the more divaricate, often longer peduncles and pedicels and from *G. formosense* by its lower growth form and smaller leaves.

4. Galium sichuanense Ehrend., sp. nov. TYPE: China. Sichuan: Dao-cheng, 3380 m, 31 July 1973, *Coll. Exp. Veg. Szechuan 2431* (holotype, PE). Figure 5.

Haec species ob habitum perenne hemicryptophyticum, folia margine in parte retrorse aculeolata atque mericarpia setis uncinatis obsita ad *Galium* sect. *Trachygalium* K. Schum. pertinet, etiam ob characteres nonnullos ad sect. *Hylaeam* (Griseb.) Ehrend. accedit, sed a harum sectionum speciebus omnibus modo ramificationis, foliis membranaceis, caulibus foliisque praecipue glabris, inflorescentiis foliosis atque floribus parvis perclare distinguitur.

Perennial herbs, from filiform rhizomes, ascending to erect, ca. 30 cm tall; stems single, strongly branched from the base, prominently 4-angled with angles whitish, glabrous, smooth or slightly aculeolate at nodes. *Leaves* and leaflike stipules on middle stem regions in whorls of 4 to 6, lanceolate, (12–)15–20 (–25) × (3–)4–6(–7) mm, drying papery and greenish brown, subsessile and gradually narrowed into the base, largest breadth near middle, apex cuspidate with hyaline point; glabrous except on adaxial surface near margins with antrorse appressed microhairs, on the ± flat margins retrorsely and sometimes also weakly antrorsely aculeolate; principal vein 1. *Inflorescences* broadly ovoid, many-flowered, the cymes terminal and lateral, 2.5–5 cm, slender, leafy, and bracteate to the last branches, ± divaricate; axes glabrous, peduncles 1.5–2 cm, pedicels 0.5–5 mm. *Flowers* hermaphrodite; *ovary* obovoid, 0.5–0.8 mm, with appressed curved hairs; *corolla* rotate, 1.5–2 mm diam., when dry reddish brown, lobed ca. 3/4, lobes 4, triangular, cuspidate. *Mericarps* ovoid, 1.8–2.5 mm, with ± spreading uncinate trichomes 0.2–0.3 mm.

Distribution and habitat. The new species is apparently endemic to Sichuan Province (Dao-Cheng) from montane forests at elevations from 3200 to 4000 m.

IUCN Red List category. The evidently rare and localized *Galium sichuanense* has not been collected since 1989. Because it grows in a forested area that is evidently not protected, its conservation assessment should be classified as Endangered (EN) according to IUCN Red List criteria (IUCN, 2001).

Phenology. According to the type specimen, *Galium sichuanense* appears to flower from July to August and to fruit from August to September.

Discussion. At the present time, only two collections of *Galium sichuanense* are known from the type locality. The new species is morphologically isolated and not closely related to any other species of the genus. Its character profile, particularly its perennial, hemicryptophytic growth form, the partly retrorsely aculeolate leaf margins, and the fruits with uncinate trichomes, delegate the taxon to *Galium* sect. *Trachygalium* K. Schum., but there are also features characteristic of *Galium* sect. *Hylaea* (Griseb.) Ehrend. (Ehrendorfer et al., 2005). Nevertheless, the combination of the branching pattern, the membranous leaves, the predominantly glabrescent stems and leaves, the leafy inflorescences, and the small flowers separate it clearly from all other members of these two sections.

The Japanese *Galium kikumuyura* (Hayata) Ohwi, another isolated and apparently relictual species from eastern Asia, can also be compared with *G. sichuanense*. The two share the leaves in whorls of four to six, the small flowers (only ca. 2 mm diam.), as well as the hooked fruit trichomes and may be related. In contrast, the habit and the somewhat antrorsely rough or even aculeolate leaf margins of *G. kikumuyura* are reminiscent of *G. bungei* (*Galium* sect. *Platygalium*). Unique characters of *G. kikumuyura* are the 1- to 3-flowered cymes on long peduncles with a single bract

Figure 5. *Galium sichuanense* Ehrend. Holotype (*Coll. Exp. Veg. Szechuan 2431*, PE), with close-up of inflorescence, flowers, and young fruits inset at top right. Scale bar = 10 cm.

and the elongate, curved mericarps. Its taxonomic placement within *Galium* is also quite uncertain.

Paratypes. CHINA. **Sichuan:** Dao-Cheng, 3200 m, 25 Aug. 1981, *Coll. Exp. Chinghai-Tibet 4295a* (PE [2]).

New Circumscriptions in the *Galium dahuricum* Group and a New Combination

During the revision of considerable herbarium material of Rubiaceae, tribe Rubieae, from East Asia

(KUN, PE, WU), it became necessary to redefine species circumscriptions within the extremely variable *Galium dahuricum* group (section *Trachygalium* s.l., sensu Ehrendorfer et al., 2005), which includes the North American *G. asprellum* and the East Asian *G. dahuricum*, *G. pseudoasprellum* Makino, *G. manshuricum* Kitag., and *G. tokyoense* Makino. For the separation of these taxa, it is suggested to place less weight on glabrous (character state "a") versus uncinate hairy mericarps (character state "b") as in Cufodontis (1940) and Chen (1999), because the corresponding forms do not rarely occur within single populations. Instead, the more reliable character states of elongate, filiform, and flexuose (character state "A") versus shorter, stiffer, and somewhat divaricate peduncles and pedicels (character state "B") should be used for species delimitation within the *G. dahuricum* group. This makes it necessary to place *G. pseudoasprellum* (Ab) and *G. manshuricum* (Ab) under *G. dahuricum* (Aa) and to reestablish *G. tokyoense* (Ba) as a species, formerly treated as a variety under *G. dahuricum* (Aa). Thus, *G. manshuricum* is treated here as *G. dahuricum* var. *manshuricum*, and *G. dahuricum* var. *fructoglabrum* is synonymized with *G. dahuricum* var. *dahuricum*. In order to accommodate critical individual plants with somewhat more congested inflorescences and uncinate hairy mericarps, Cufodontis (1940) had created the variety *G. pseudoasprellum* var. *densiflorum*. This variety, slightly approaching *G. tokyoense*, has to be transferred now to *G. dahuricum*.

1. Galium dahuricum Turcz. ex Ledeb., Fl. Ross. 2: 409. 1844. Turcz. in Bull. Soc. Imp. Natural. Moscou 18: 312–313. 1845. TYPE: Russia, in umbrosis humidis Dahuriae maxime orientalis, prope unionem fluviorum Schilka et Argun, ad rivuolos, s.d., *N. S. Turczaninow s.n.* (holotype, LE).

1a. Galium dahuricum var. **dahuricum.**

1b. Galium dahuricum var. **densiflorum** (Cufod.) Ehrend., comb. nov. Basionym: *Galium pseudoasprellum* Makino var. *densiflorum* Cufod., Oesterr. Bot. Z. 89: 237. 1940. TYPE: China. Sikang [Sichuan]: "Kangting vel Tachienlu, in prato herboso-fruticoso," 2700 m, 10 July 1934, *H. Smith s.n.* (holotype, UPS).

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Prestonia leco, una Especie Nueva de Apocynaceae de los Bosques Montanos Húmedos de Bolivia

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Resumen. Se describe e ilustra a *Prestonia leco* A. Fuentes & J. F. Morales (Apocynaceae), una especie nueva de los bosques montanos húmedos del noroeste de Bolivia. Esta especie parece estar cercanamente relacionada con *P. denticulata* (Vell.) Woodson, de la que difiere por sus inflorescencias conspicuamente ramificadas (vs. no ramificadas) y corola con el tubo floral más largo (18–22 mm vs. 11–13 mm).

Abstract. *Prestonia leco* A. Fuentes & J. F. Morales (Apocynaceae), a new species from the wet montane forest of northwestern Bolivia, is described and illustrated. It appears to be closely related to *P. denticulata* (Vell.) Woodson, but differs by its conspicuously branched inflorescences (vs. unbranched) and longer corolla tube (18–22 mm vs. 11–13 mm).

Key words: Apocynaceae, Apocynoideae, Bolivia, Echiteae, IUCN Red List, *Prestonia*, Yungas montane forest.

Apocynaceae se divide en cinco subfamilias (Endress & Bruyns, 2000; Endress et al., 2007), de las cuales las Apocynoideae y Rauvolfioideae están representadas en Bolivia, con al menos 124 especies reportadas (Morales & Fuentes, en prep.) y un estimado de 150 especies de Asclepiadoideae (Goyder, pers. comm.). El extensivo trabajo de campo realizado en este país en los últimos 20 años ha revelado una serie de novedades taxonómicas, que en el caso de las Apocynoideae y Rauvolfioideae, incluyen nuevas especies y registros (e.g., Morales & Fuentes, 2004a, b; Goyder et al., 2005). El género *Prestonia* R. Br. tiene ca. 55 especies distribuidas desde México hasta el norte de Argentina y las Antillas (Morales, 2004, 2006, 2007), de las cuales alrededor de 13 están reportadas para Bolivia (Morales & Fuentes, en prep.). En la presente contribución se añade una especie más del género *Prestonia* a la flora de Bolivia, con la descripción de *P. leco* A. Fuentes & J. F. Morales proveniente de los bosques montanos del noroeste del país.

Prestonia leco A. Fuentes & J. F. Morales, sp. nov. TIPO: Bolivia. La Paz: Prov. Franz Tamayo, Santo Domingo, cabeceras del arroyo Tintaya, 14°46′21″S, 068°35′20″W, 1527 m, 25 oct. 2006 (fl., fr.), *A. Fuentes*, *M. Cornejo*, *E. Ticona & S. Sompero 11225* (holotipo, LPB foto; isotipos, BOLV, INB, LPB, MO, NY, USZ). Figura 1.

Haec species a *Prestonia denticulata* (Vell.) Woodson, cui affinis, inflorescentiis di- vel trichotome divisis (vs. simplicibus) et corollae tubo 18–22 mm (vs. 11–13 mm) longo differt.

Liana leñosa, tallos viejos 1.5–3(–5.8) cm diám., la corteza corchosa, fisurada a acanalada, crema, con látex blanco al corte, ramas jóvenes seríceo-pubescentes, glabrescentes con la edad, huecas al secar; entrenudos 1.7–7.8 cm; coléteres intrapeciolares inconspicuos, 0.7–1.3 mm. Hojas con pecíolo 0.4–0.7(–1.2) cm; láminas 7–15.2(–18) × 2.8–7.7 cm, obovadas a elípticas, el ápice acuminado, agudo a redondeado, la base aguda, raramente obtusa, cartáceas, el margen revoluto, esparcidamente pubérulas abaxialmente, glabrescentes con la edad, el envés pubérulo, con indumento ligeramente ferrugíneo, la nervación broquidódroma, nervios secundarios 5(6) pares, impresos en ambas caras, la venación terciaria inconspicua. Inflorescencia una cima corimbiforme, axilar o subterminal, con 11 a 22 flores; pedúnculo 1.5–7(–10.5) cm, aplanado, raquis seríceo-pubescente; brácteas florales 2.5–6 × 0.8–1.7 mm, triangulares a oblongas, escariosas; pedicelos 8–20 mm. Cáliz con base corta, ca. 2 mm, tomentosa; sépalos 11–16.5 × 4–7 mm, elípticos, lanceolados a oblongos, el ápice agudo, no reflejo, verdes, escariosos, con un

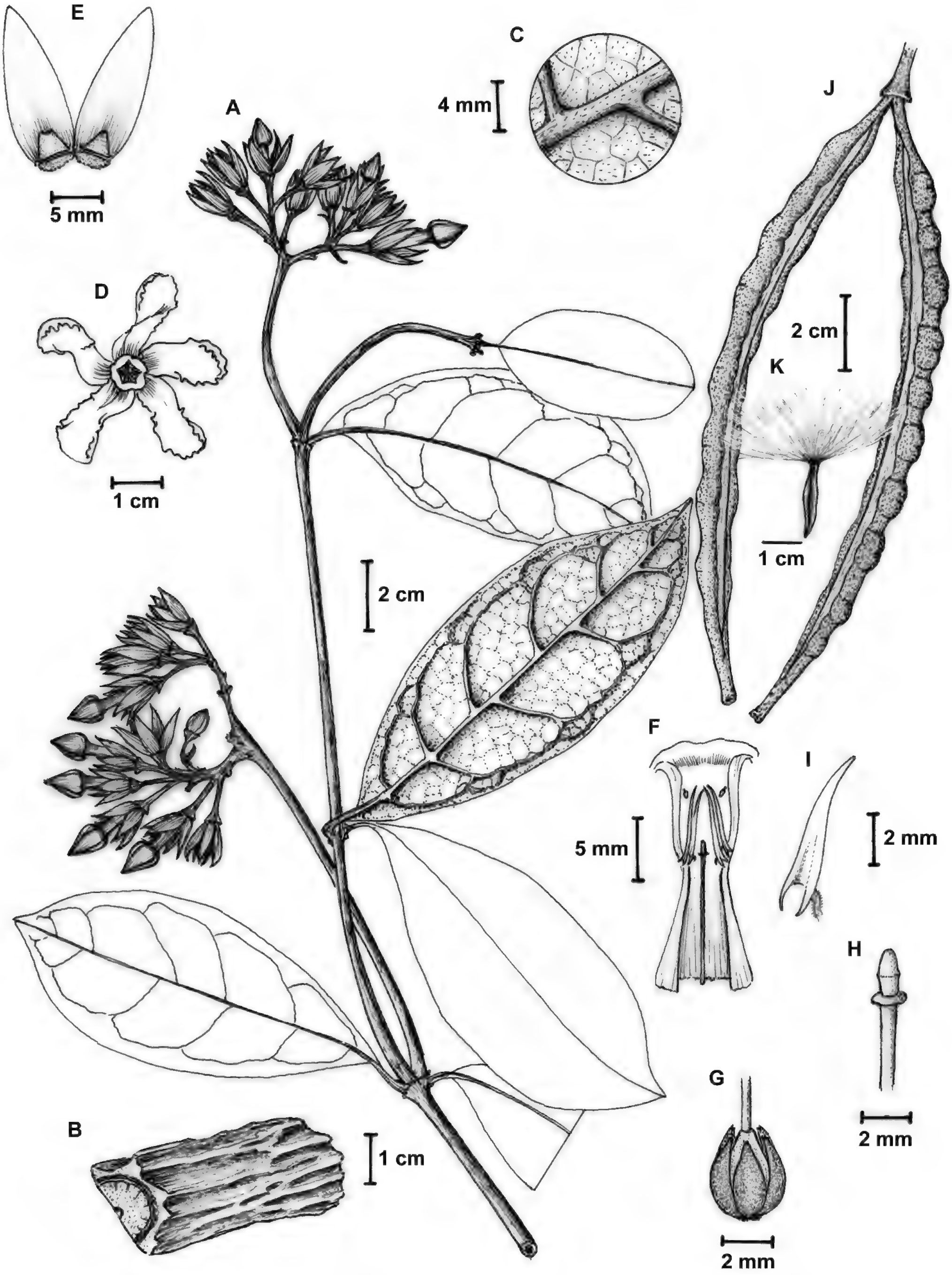

Figura 1. *Prestonia leco* A. Fuentes & J. F. Morales. —A. Rama florífera. —B. Sección de tallo viejo mostrando la corteza externa. —C. Detalle del indumento del envés de la hoja. —D. Vista frontal de la flor. —E. Par de sépalos con coléteres basales. —F. Sección longitudinal del tubo de la flor. —G. Nectario. —H. Cabeza estigmática. —I. Antera. —J. Fruto. —K. Semilla. A–I, K dibujados del holotipo *Fuentes et al. 11225* (LPB); J de *Fuentes et al. 9046* (LPB).

coléter solitario en la base de la cara adaxial, la superficie adaxial glabra, la superficie abaxial seríceo-pubescente, margen translúcido, la venación no evidente; corola hipocraterimorfa, el tubo amarillo claro, por lo general glabro, recto, cilíndrico, ensanchado en la base, 18–22 mm largo, 4–6 mm diám. en la base, pentagonal en sección transversal, angostándose gradualmente hasta el nivel de la

inserción de las anteras, donde vuelve a ensancharse y se forman 5 costillas, glabro externamente, interiormente glabro en la mitad inferior y hacia el extremo superior, hirsuto al nivel de las anteras, la corona anular conspicua, ligeramente pentalobulada, rosado-magenta, muy esparcidamente puberulenta en la base de los lóbulos por el haz y puberulenta en la base de los lóbulos por el envés; lóbulos de la corola 19–22 × 8–11 mm, oblanceolados a obovados, asimétricos, torcidos en espiral, la mitad inferior con borde recto, la mitad superior con borde crespo, membranáceos, amarillo claros, con una mancha roja bilobulada y difusa hacia la base adaxialmente; apéndices epistaminales ovados, reflejos, ca. 1 mm, inclusos, insertos ca. 4 mm por debajo del orificio del tubo de la corola; anteras 5–7 mm, con el dorso glabro, insertas casi a la mitad del tubo, inclusas, los filamentos hirsutos; ovario ca. 2.5 × 1.5 mm, glabro, el nectario ca. 2.5 mm, conspicuamente pentalobulado, cada lóbulo irregularmente lacerado en el ápice; estilo ca. 13 mm, cabeza estigmática 1.3–1.5 mm. Folículos moniliformes, divaricados 18–38 × 1.2–1.6 cm, pubérulos cuando inmaduros, glabrescentes con la edad, lenticelados, blanco-parduzcos; semillas 14–18 × 3–5 mm, pardas, la coma 2–4.5 cm, pardo-dorada.

Distribución y hábitat. Esta especie se conoce en bosques montanos húmedos de yungas del departamento de La Paz en Bolivia. Es una liana del dosel y crece entre 1400 y 2000 m de elevación, en bosques primarios.

Categoria de la Lista Roja de UICN. Tomando en cuenta la distribución altitudinal y latitudinal de esta especie, tiene un área de extensión de presencia de ca. 16,500 km², al momento se conoce de menos de 10 localidades y el área boscosa donde crece se encuentra en un proceso continuo de disminución y alteración de la calidad del hábitat, por lo que asignamos la categoría de Vulnerable según los criterios VU B1ab(iii) de la IUCN (2001). *Prestonia leco* está protegida en el Parque Nacional Madidi, pero las poblaciones conocidas de esta especie en el parque se encuentran amenazadas por su cercanía con comunidades y caminos.

Etimología. El epíteto es un homenaje a la etnia Leco, en cuyo territorio (comunidad Santo Domingo, departamento de La Paz) se coleccionó el espécimen tipo. Los Lecos, con su forma de vida y organizaciones territoriales, contribuyen de manera significativa a la conservación de ecosistemas tanto fuera como dentro de algunas áreas protegidas, como el Parque Nacional Madidi y el Área Natural de Manejo Integrado Apolobamba.

Discusión. *Prestonia leco* se diferencia claramente de otras especies del género por presentar anteras inclusas, insertas casi a la mitad de la longitud del tubo, apéndices supraestaminales inclusos y frutos moniliformes. Este último carácter sólo se conoce en *P. denticulata* (Vell.) Woodson (Morales, 2007), de la que se diferencia por tener inflorescencia conspicuamente ramificada (vs. no ramificada) y el tubo floral más largo (18–22 mm vs. 11–13 mm), además *P. denticulata* sólo se conoce de la Mata Atlántica del sureste de Brasil, con una población disyunta más al norte en Pará. Otra especie morfológicamente similar es *P. didyma* (Vell.) Woodson, de la que *P. leco* se diferencia por sus hojas con la lámina cartácea (vs. membranácea), la mayor longitud del tubo floral (18–22 mm vs. 8–15 mm), las anteras inclusas (vs. exsertas al menos apicalmente) y los folículos moniliformes (vs. lisos). Especímenes de *P. leco* fueron identificados anteriormente como *P. annularis* (L. f.) G. Don y *P. robusta* Rusby. Se diferencia de *P. annularis* porque tiene las anteras insertas casi a la mitad de la longitud del tubo (vs. insertas en el tercio apical) y frutos moniliformes (vs. lisos). Difiere de *P. robusta* por sus inflorescencias corimbiformes (vs. umbeliformes a subumbeliformes), flores con el tubo ligeramente más largo (18–22 mm vs. 13–17 mm), apéndices supraestaminales inclusos (vs. apicalmente exsertos o apenas incluidos y con los ápices casi al mismo nivel del orificio) y folículos moniliformes (vs. lisos) y usualmente más largos (18–38 cm vs. 16–19.5 cm).

Paratipos. BOLIVIA. **Dpto. La Paz:** Sud Yungas, Chulumani, entrando a Apa Apa, 27 oct. 2006, *S. Beck y alumnos biología UMSA 29543* (LPB); Mojos, Fuertecillo, 25 abr. 2007, *L. Cayola, N. Chapi, G. Chive, F. Andia & T. Alvarez 2596* (LPB, MO); Prov. Franz Tamayo, Parque Nac. Madidi, Fuertecillo, 29 jun. 2005 (fr.), *A. Fuentes, E. Cuevas & R. Cuevas 9046* (INB, LPB, MO); Santo Domingo, Tintaya, 16 oct. 2006 (fl., fr.), *A. Fuentes, M. Cornejo, E. Ticona, S. Sompero & C. Cuqui 11052* (LPB, MO); Área Nat. Man. Integr. Madidi, entre Moima y Pata, 20 ago. 2008, *A. Fuentes, H. Huaylla, R. Lara & R. Vasquez 13303* (LPB); Calabatea, 4 jun. 1990, *A. Gentry & S. Beck 70925* (LPB, MO); en la senda de Fuertecillo a Tokuaque, 11 nov. 2001 (fl.), *M. Orellana & N. Quispe* 2004 (LPB); Prov. Nor Yungas, 4.6 km de Yolosa, 12 nov. 1982 (fl.), *J. Solomon 8760* (INB, LPB, MO, USF, WAG); 14.3 km SO de Yolosa, carr. a Chuspipata, 23 mar. 1984, *J. Solomon, B. Stein & M. Uehling 12077* (LPB, MO).

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Liparis cordifolia var. *gongshanensis* (Orchidaceae, Malaxideae), a New Variety from Yunnan, China

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Abstract. *Liparis cordifolia* Hook. f. var. *gongshanensis* X. H. Jin (Orchidaceae, Malaxideae) is described from Yunnan, China. It differs from the typical variety by having larger flowers with the sepals and petals ca. 1.1 cm long (vs. 0.8–0.9 cm in variety *cordifolia*) and a circular, ciliate lip with a pair of small calli at the base (vs. lip obovate-deltoid, entire, and ecallose in variety *cordifolia*). The new variety appears to be restricted to evergreen humid forest in the Dulong River valley (upper portion of the Irrawaddy River), from Yunnan, China. A lectotype is designated for *L. cordifolia*.

Key words: China, IUCN Red List, *Liparis*, Malaxideae, Orchidaceae.

The genus *Liparis* Rich. s.l. (Orchidaceae, Malaxideae) consists of 150 to 320 species distributed in the tropics worldwide as well as in temperate regions (Seidenfaden, 1976, 1992; Chen, 1999; Comber, 2001; Pearce & Cribb, 2002; Pridgeon et al., 2005). *Liparis* s.l. is readily separated from other members in Malaxideae by the resupinate flowers with a curved column. The last worldwide taxonomic treatment of *Liparis* was by Ridley (1886), in which 110 species were recognized, and many new species have been published since that time. Recently, more small genera have been segregated from *Liparis* s.l., e.g., *Alatiliparis* Marg. & Szlach., *Disticholiparis* Marg. & Szlach., and *Ypsilorchis* Z. J. Liu, S. C. Chen & L. J. Chen. The taxonomy of this genus is very confused and inconsistent across its distributional range (e.g., Margonska & Szlachetko, 2001, 2004; Pridgeon et al., 2005; Liu et al., 2008). *Liparis* s.l. is followed here because most of the previous generic treatments of *Liparis* either lack sound phylogenetic analysis or are based on insufficient data (e.g., Cameron, 2005).

There are about 50 to 60 species of *Liparis* in China (Chen, 1999; Chen et al., 2009), including many recently described species from China or neighboring regions (Averyanov & Averyanova, 2003; Ormerod, 2007; Yang et al., 2009). During fieldwork in the Gaoligong Mountains, northwestern Yunnan, China, in 2008, a new variety of *L. cordifolia* was discovered and is described here.

1. Liparis cordifolia Hook. f., Icon. Pl. ser. 3(19): tab. 1811. 1889. TYPE: India. Kashia, *Hooker & Thomson 8* (lectotype, designated here, K).

Pearce and Cribb (2002) listed three syntypes of *Liparis cordifolia*, one of which is designated here as lectotype for this widespread and somewhat polymorphic species.

1a. Liparis cordifolia var. **cordifolia**.

1b. Liparis cordifolia var. **gongshanensis** X. H. Jin, var. nov. TYPE: China. Yunnan: Gongshan Co., Dulong Distr., in forest, 2400 m, 24 June 2008 (fl.), *X. H. Jin 9589* (holotype, PE). Figure 1.

Haec varietas a *Liparide cordifolia* Hook. f. var. *cordifolia* bracteis lanceolatis longioribus, floribus majoribus sepalis petalis et labello ca. 1.1 cm longis atque labello circulari ciliato ad basem pari callorum parvorum munito perfacile distinguitur.

Epiphyte; pseudobulb ovoid, ca. 0.5 cm diam., enclosed by a membranous sheath. Leaf 1, blade elliptic, ca. 5.5 × 2.8 cm, acuminate, basally narrowed into the petiole; petiole ca. 2 cm. Inflorescence 5–6 cm, 3- to 5-flowered, rachis and peduncle purple; bracts lanceolate, ca. 0.6 cm, ciliate. Flowers green, pedicel and ovary pale brownish purple, center of lip disc pale brownish green. Pedicel and ovary 1.5–1.7 cm; dorsal sepal linear, ca. 1.1 × 0.15 cm, 3-veined; lateral sepals parallel under the lip, linear-lanceolate, 3-veined, acuminate, obtuse, ca. 1 × 0.3 cm; petals linear, ca. 1.1 × 0.1 cm; lip circular, ca. 1.1 × 1.2 cm, base with a pair of small calli, middle vein fleshy to disc; lip margin ciliate; calli 2, slightly lanceolate; column curved, base swollen, ca. 0.5 cm long, a pair of triangular column wings beside the stigmatic region; anther cap elliptic, truncate in front. Fruit not observed.

Distribution and habitat. This new variety of *Liparis cordifolia* with a circular and ciliate lip (vs. a deltoid lip in variety *cordifolia*) was discovered in the Dulong River valley, which is the upper extent of the Irrawaddy River in Yunnan, China. The new variety is epiphytic on tree trunks in humid evergreen

Figure 1. *Liparis cordifolia* var. *gongshanensis* X. H. Jin. Front view of flower at the type locality. Photo by X. H. Jin.

broadleaf forest at an elevation of 2400 m, and is rare within this area. During our two-day stay in this area in 2008, we discovered only 20 plants with flowers.

IUCN Red List category. As may happen with newly discovered taxa, *Liparis cordifolia* var. *gongshanensis* is known only from its type locality, which makes it difficult to estimate its conservation status. However, the Dulong River valley has recently been greatly affected by road construction and increasing tourism. We therefore consider the new variety to be Endangered (EN Blab[iii]) according to IUCN Red List criteria (IUCN, 2001), based on its known area of occupancy and continuing decline of habitat extent and quality.

Relationships. The new variety is readily distinguished from *Liparis cordifolia* var. *cordifolia* by its lanceolate bracts ca. 0.6 cm long (vs. bracts elliptic to triangular and ca. 0.1 cm long in the typical variety); larger flowers with the sepals, petals, and lip ca. 1.1 cm long (vs. sepals, petals, and lip 0.8–0.9 cm long); and a circular, ciliate lip with a pair of small calli (vs. lip deltoid).

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Passiflora madidiana, a New Species of Passifloraceae from Northern Bolivia

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Abstract. We describe *Passiflora madidiana* P. Jørg., Cayola & Araujo-Murakami (Passifloraceae) as new from Bolivia. It belongs to *Passiflora* L. subg. *Passiflora* and is probably closely related to *P. crassifolia* Killip, *P. mapiriensis* Harms, *P. actinia* Hook., and *P. jilekii* Wawra. The material was collected during a floristic inventory project of the dry forest within the Madidi National Park. We presume the species to be endemic to these highly seasonal and isolated dry forests that surround the upper part of the Río Tuichi within the Madidi National Park.

Resumen. Describimos a *Passiflora madidiana* P. Jørg., Cayola & Araujo-Murakami como una especie nueva, que pertenece a *Passiflora* L. subg. *Passiflora* y es probablemente cercana a *P. crassifolia* Killip, *P. mapiriensis* Harms, *P. actinia* Hook. y *P. jilekii* Wawra. El material fue colectado durante el inventario florístico del bosque seco en el Parque Nacional Madidi. Presumimos que esta especie es endémica de estos bosques secos estacionales y aislados que están en los alrededores de la parte alta del río Tuichi dentro el Parque Nacional Madidi.

Key words: Bolivia, dry forests, IUCN Red List, Madidi National Park, *Passiflora*, Passifloraceae.

As a result of making quantitative inventories, new species occasionally emerge. The new species described here was first collected in 2003, but flowering material was not secured until a concerted effort was made to inventory the dry forest in and around the upper part of Río Tuichi in 2004–2005. Both inventories were part of the Proyecto Madidi, initiated in 2001, with the aim of making a botanical inventory of the Madidi region in northern Bolivia and educating university students in the process. We describe the new species here in order to make the name available for incorporation in the upcoming Bolivian catalog of vascular plants (Jørgensen et al., in prep.).

Passiflora madidiana P. Jørg., Cayola & Araujo-Murakami, sp. nov. TYPE: Bolivia. La Paz: Franz Tamayo, Parque Nac. y Área Natural de Manejo Integrado Madidi, Sect. Pintata próx. al Río Tuichi entre las comunidades de Virgen del Rosario y Suyo Suyo, bosque seco semideciduo en filos y cimas de cerros, 14°26′34″S, 68°34′47″W, 1150 m, 4 Dec. 2005 (fl., fr.), *A. Araujo-Murakami, A. Fernández, S. Paredes, E. Cuevas & C. Cuevas 2599* (holotype, LPB; isotypes, BOLV, MA, MO, US, USZ). Figures 1, 2.

Haec species a *Passiflora crassifolia* Killip caulibus vetustis hirsutis, stipulis bis minoribus, bracteis obtusis adaxilaliter glabris atque coronae serie externa ter longiore differt.

Herbaceous to woody vine; stems cylindric, striate, hirsute, older stems dark olive green, younger stems light green, puberulent; stipules (2–)2.4–3(–4.1) × 0.7–1.1(–1.6) cm, reniform, extremely asymmetric, sessile, apex abruptly acuminate, mucronate, base rounded, margin glandular-serrate, hirsute. Petiole (1.5–)2.4–3.2(–3.8) cm, hirsute; glands (2 to)4(to 6), sessile, 1 pair 1–1.5 cm from leaf base, opposite-subopposite, the rest irregularly distributed. Leaf

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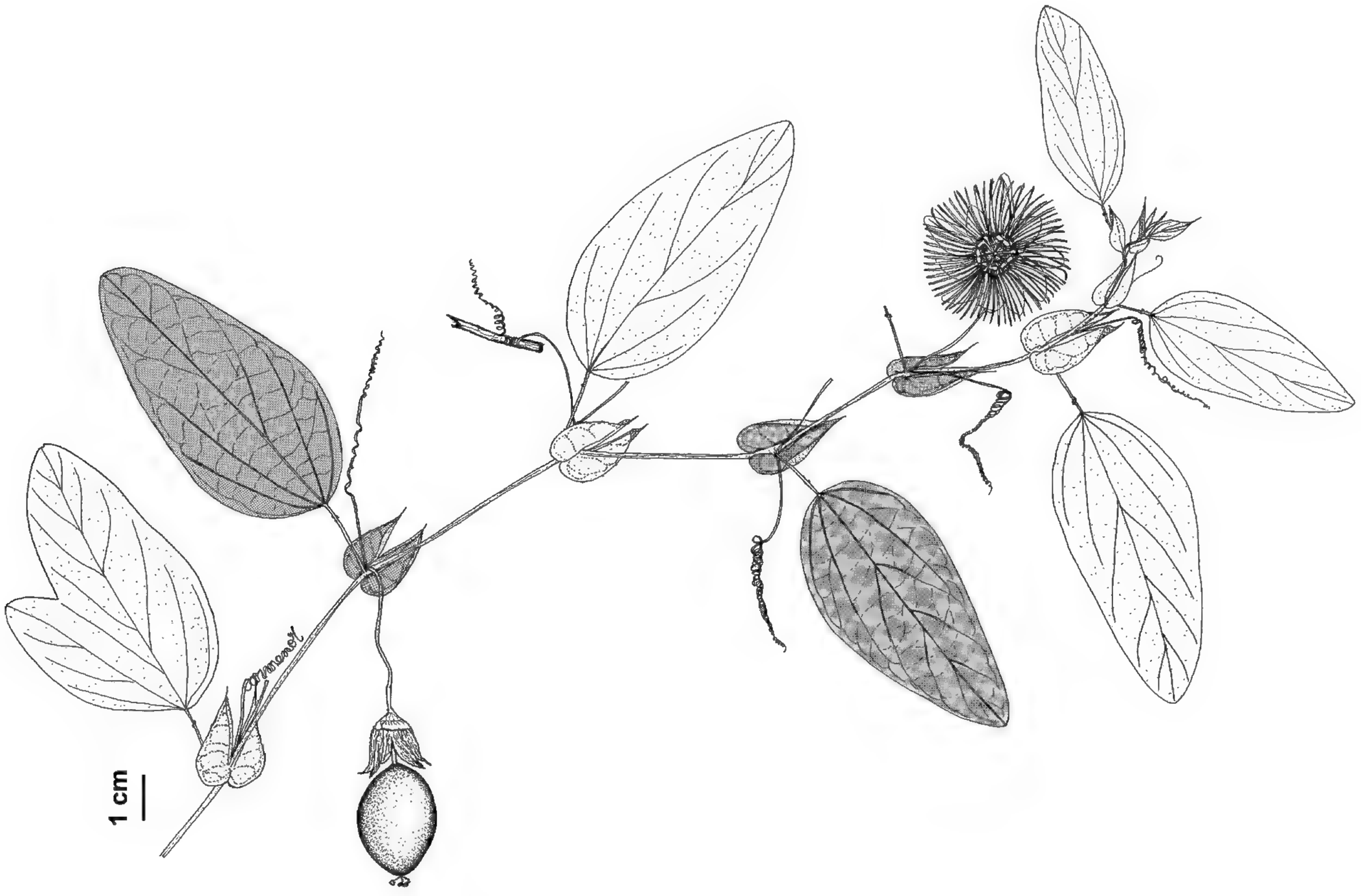

Figure 1. Fertile habit of *Passiflora madidiana* P. Jørg., Cayola & Araujo-Murakami. Illustration by Carmen Ulloa Ulloa from the holotype *Araujo-Murakami et al. 2599* (LPB).

blade (5–)7.2–10 × (2.7–)3.4–4.5(–4.9) cm, ovate, entire, rarely irregularly bilobed or trilobed, when bilobed or trilobed the angles between midvein and lateral veins 34°–38°; entire leaves (1 to)3(to 5)-nerved, angle between lateral veins and midvein (20°–)30°(–36°) in 3-nerved leaves, angle (45°–)55°(–60°) in 5-nerved leaves; apex obtuse, base truncate-cuneate, margin barely glandular-serrate toward the base, revolute; adaxial surface hirsute, pubescence denser along the principal veins, abaxial surface densely hirsute. Peduncle (2–)2.8–3.5 cm, longer in fruit to 3.3–4 cm, hirsute; bracts 1–1.3 × 0.7–0.9 cm, ovate-elliptic, adaxial surface glabrous, abaxial surface hirsute along principal vein, light green or occasionally light yellow, caducous before the fruit matures, apex obtuse, base cuneate, margin glandular-serrate, hirsute; pedicel (0.5–)0.7–0.9 cm, hirsute; flower solitary; sepals 21–22 × 6.5–7 mm with a pronounced keel, abaxial surface puberulent; awn ca. 1.5 mm; petals white, ca. 21 × 5 mm; corona in 3 filiform series, outer series ca. 19 mm, white with lower 1/5 purple, base occasionally white; second series 2.8–3 mm, white with purple apex; third series 1–1.5 mm, white with purple apex; operculum (1.5–)2–3.5(–4) mm tall, purple, with a filament series attached on the outside; limen ca. 1 mm, placed at 2/3 of the distance between the base of the androgynophore and the operculum; androgynophore ca. 7.5 mm; free part of filaments ca. 5.5 mm; anthers ca. 6.5 × 2.1 mm; ovary ca. 5 × 3 mm, green; style ca. 7 mm, light green, stigma ca. 2 mm, green. Fruit (3–)3.4–3.6 cm, ovoid, immature green, drying dark brown; seeds 4.5 × 3 mm, foveolate with 20 to 22 pits, dark brown.

Distribution, habitat, and IUCN Red List category. *Passiflora madidiana* is found in semideciduous dry forest, along the Río Tuichi in the Madidi National Park at 850–1150 m elevation. We consider the species to be Vulnerable (VU B1,C) following IUCN Red List criteria (IUCN, 2001; IUCN Standards and Petitions Working Group, 2008). The threat to the species is limited if Madidi National Park is respected, but several places within the dry forest area are at risk of fragmentation as a result of increasing cattle and farming activities. So far *P. madidiana* has been collected in three different settings, first on the upper slopes and ridges where the vegetation is somewhat stunted and dominated by *Tabebuia aurea* (Silva Manso) Benth. & Hook. f. ex S. Moore, *Jacaranda mimosifolia* D. Don, *Hymenaea courbaril* L., *Pseudobombax septenatum* (Jacq.) Dugand, *P. longiflorum* (Mart. & Zucc.) A. Robyns, *Aralia soratensis* Marchal, *Anadenanthera colubrina* (Vell.) Brenan, *Trichilia elegans* A. Juss., *Agonandra excelsa*

Figure 2. Flowering branch of *Passiflora madidiana* P. Jørg., Cayola & Araujo-Murakami, from the type *Araujo-Murakami et al. 2599*. Photograph by A. Araujo-Murakami.

Griseb., *Astronium urundeuva* (Allemão) Engl., and *A. fraxinifolium* Schott ex Spreng. The new species has also been found in taller semideciduous forest with a canopy height of 15–20 m dominated by *Anadenanthera colubrina*, *Tabebuia impetiginosa* (Mart. ex DC.) Standl., *Phyllostylon rhamnoides* (J. Poiss.) Taub., *Astronium urundeuva*, *Machaerium scleroxylon* Tul., *Acacia riparia* Kunth, *Allophylus edulis* (A. St.-Hil., Cambess. & A. Juss.) Radlk., *Ceiba boliviana* Britten & Baker f., *Ximenia americana* L., and *Zanthoxylum fagara* subsp. *lentiscifolium* (Humb. & Bonpl. ex Willd.) Reynel as emergent and canopy-forming species, with an understory composed of *Trichilia catigua* A. Juss., *Amyris* P. Browne, *Ruprechtia apetala* Wedd., *Maytenus cardenasii* Rusby, and *Urera baccifera* (L.) Gaudich. ex Wedd., and in some places dominated by *Chusquea* Kunth and three species of Cactaceae—*Praecereus euchlorus* (F. A. C. Weber) N. P. Taylor, *Cereus tacuaralensis* Cárdenas, and *Opuntia brasiliensis* (Willd.) Haw. The third location was a semideciduous dry forest on slopes dominated by *Anadenanthera colubrina*, *Oxandra espintana* (Spruce ex Benth.) Baill., *Phyllostylon rhamnoides*, *Machaerium scleroxylon*, and *Capparis polyantha* Triana & Planch.

Phenology. *Passiflora madidiana* has been found with flowers and fruits from late November to early December and in fruit in February. The new species seems to be synchronized with the pronounced changes in temperature and humidity of the rainy season, which starts with torrential rains in November and lasts until March–April.

Etymology and history of discovery. The new species is named after the Madidi National Park, one of the world's most biodiverse protected areas (WCS Bolivia, 2007). *Passiflora madidiana* was first collected in 2003 by Cayola near Sipia in the Madidi National Park; the material consisted only of two

branches and a single immature fruit, but we were already convinced then that the material represented a new species. It was not until 2005, however, when a more concentrated collecting effort took place in the dry forest along Río Tuichi that more and fully flowering material was collected by Araujo-Murakami.

Diagnostic characters and possible relationships. *Passiflora madidiana* is difficult to key to series within the subgenus *Passiflora* L. (named subgenus *Granadilla* (Mill.) Rchb.) in the most recent monograph treatment of Passifloraceae (Killip, 1938). The species has mostly entire leaves, but 2- and 3-lobed leaves are found, which makes it difficult to fit it within series *Simplicifoliae* sensu Killip (1938), characterized by entire leaves. In the series with 3-lobed leaves, *Lobatae* sensu Killip (1938) and *Menispermifoliae* Killip ex Cervi, it stands out by either being densely puberulent (if placed in *Lobatae*) or not having the dense hirsute pubescence of *Menispermifoliae*.

Species of series *Lobatae* are glabrous except for *Passiflora gardneri* Mast., and *P. madidiana* clearly differs from that species by having mostly entire semicoriaceous leaves versus 3-lobed membranous leaves. The stipules of *P. madidiana* are five times longer and two times wider than in *P. gardneri*, and the leaves are only half as wide. *Passiflora madidiana* has only three corona series versus four to five in *P. gardneri*, but the outer corona is twice as long. The two species do not appear to be closely related.

In series *Simplicifoliae*, *Passiflora madidiana* keys to *P. actinia* Hook., *P. jilekii* Wawra, or *P. mapiriensis* Harms in Killip (1938). *Passiflora mapiriensis* is found only about 115 km south of the Tuichi drainage, but differs from *P. madidiana* by being a glabrous species with a pubescent ovary; smaller lanceolate stipules that are early deciduous; bracts that are much larger and lanceolate, cuneate, and acuminate; and a corona of four or five series and larger for all series, but with the awn of the sepal smaller. The Brazilian species *P. actinia* and *P. jilekii* differ from *P. madidiana* by being glabrous. *Passiflora madidiana* further differs from *P. actinia* in its narrower leaves, obtuse bracts that are about half the size, much smaller flowers, the corona in fewer series, and the markedly different coloration of the corona; it can be distinguished from *P. jilekii* by its smaller and more membranous leaves, shorter peduncles, and much longer awn.

In series *Menispermifoliae*, *Passiflora madidiana* will key to *P. crassifolia* Killip, a species from Junín, Peru, found at similar elevations but in humid vegetation (T. Boza, pers. comm.). This species is very similar to *P. madidiana* in general appearance, and it is the only member of the series with entire leaves; however, it differs from *P. madidiana* in a number of characteristics, particularly in being puberulent versus densely villous, having stipules that are twice as large and bracts that differ in pubescence and shape, and most noticeably in the outer corona, which is almost 2 cm long in *P. madidiana* versus only 7 mm long in *P. crassifolia*.

The discovery of *Passiflora madidiana* and the postulated relationships with *P. crassifolia*, *P. jilekii*, *P. actinia*, and *P. mapiriensis* suggest that both series *Simplicifoliae* and series *Menispermifoliae* are in need of taxonomic rearrangement. The new species is placed in section *Granadillastrum* Triana & Planch. (Feuillet & MacDougal, 2003), which includes all the series and species discussed above.

Paratypes. BOLIVIA. **La Paz:** Franz Tamayo, Parque Nac. y Área Natural de Manejo Integrado Madidi, Sect. Pintata próx. al Río Tuichi entre Virgen del Rosario y Suyo Suyo, 14°26′34″S, 68.34′47″W, 4 Dec. 2005 (fl., fr.), *A. Araujo-Murakami, A. Fernandez & S. Paredes, E. Cuevas & C. Cuevas 2574* (LPB); Sect. Pintata próx. a la comun. de Sipia entre Virgen del Rosario y Suyo Suyo, 14°28′06″S, 68°32′19.7″W, 19 Feb. 2003 (fr.), *L. Cayola, A. Araujo, H. Cabrera, M. Calzadilla, F. Canqui, C. Maldonado, N. Paniagua, R. Alvarez, A. Alvarez & M. Alvarez 3* (LPB, MO); Sect. Pintata próx. al Rio Tuichi entre Virgen del Rosario y Suyo-suyo, 14°26′34″S, 68°34′47″W, 4 Dec. 2005 (fr.), *A. Araujo-Murakami, A. Poma, P. Garagorri, S. Paredes & E. Cuevas 2420* (LPB).

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A New Endemic Species in *Trichophorum* (Cyperaceae) from South Korea

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Abstract. *Trichophorum dioicum* J. Jung & H. K. Choi (Cyperaceae) was observed growing on limestone cliffs within a government-protected area, from Gangwon-do, South Korea. Morphological characteristics of the new species, such as the reduced leaf blade and the single spikelet at the culm terminus, correspond to *Trichophorum* Pers., a sister genus among *Scirpus* L. s.l. Previous molecular analysis of the chloroplast *rbcL* gene and ITS region of nuclear ribosomal DNA supported the identity of this new endemic species as a member of *Trichophorum*.

Key words: Cyperaceae, IUCN Red List, South Korea, *Trichophorum*.

Recently, a new endemic sedge, identified as "*Scirpus dioicus*" was described in South Korea (Lee & Oh, 2006b: 614). They compared this species with *S. cespitosus* L., which is very similar in morphology, and indicated the dioecism of the new taxon. However, the type was not specified and the name was invalidly published (cf. Art. 37.7, McNeill et al., 2006). Lee and Oh (2006b) maintained a broad concept of *Scirpus* L., which included numerous taxa such as *Trichophorum* Pers., *Bolboschoenus* (Asch.) Palla, and *Schoenoplectus* (Rchb.) Palla. Later, in the same year, the same authors reported a new genus, as "*Neoscirpus*," based on the characteristics of their dioecious sedge (Lee & Oh, 2006a: 25). However, the type was not specified and the generic name was established upon the invalid name from 2006.

Scirpus s.l. has been recognized as a polyphyletic group and is generally accepted as a taxonomic complex of several genera (Koyama, 1978; Bruhl, 1995; Goetghebeur, 1998). One segregated genus, *Trichophorum*, has discriminating characteristics such as leaves with a ligule and a reduced blade, small primary bracts, and an inflorescence with a single or few spikelets and bisexual flowers (Goetghebeur, 1998). Moreover, a molecular phylogenetic study based on analyses of the chloroplast *rbcL* gene and *trnL-F* noncoding region supported *Trichophorum* as a genus independent from *Scirpus* s.l. (Muasya et al., 2009).

The evidence supporting the establishment of a separate genus (Lee & Oh, 2006a)—habitat, flowering season, and achene shape in *Scirpus* s.l.—are variable characteristics and so are inconclusive. Dioecism is not abundant, but is generally observed in angiosperms (Dellaporta & Calderon-Urrea, 1993) and has been reported in several genera of Cyperaceae, such as *Carex* L., *Scleria* P. J. Bergius, and *Everardia* Ridl. (Bruhl, 1995; Goetghebeur, 1998). Moreover, the entity described as dioecious by Lee and Oh (2006a, b) is actually polygamous. The bisexual flowers and achenes of this species are observed in male plants (partially bisexual), while female plants present only female flowers. Morphologically, this taxon shares synapomorphy with *Trichophorum*. In addition to these morphological similarities, its chloroplast *rbcL* gene and nuclear ITS DNA sequences display greater similarity to the type of *Trichophorum* (*T. alpinum* (L.) Pers.) than to other species of *Scirpus* s.l. (unpublished GenBank accession numbers FJ797640 and FJ797641). We suggest that the new taxon does not belong to *Scirpus* and that its phylogenetic identity lies within *Trichophorum*, which is caespitose and rhizomatous, and has ligulate leaves, a reduced leaf blade, and a single spikelet at the culm terminus.

Trichophorum dioicum J. Jung & H. K. Choi, sp. nov. *Scirpus dioicus* Y. N. Lee & Y. C. Oh, New Fl. Korea 2: 614, [15 Sep.] 2006, nom. inval. *Neoscirpus dioicus* (Y. N. Lee & Y. C. Oh) Y. N. Lee & Y. C. Oh, Bull. Korea Pl. Res. 6: 25, [20 Dec.] 2006, nom. inval. TYPE: Korea [South Korea]. Gangwon-do: Jeongseon-gun, 17 Apr. 2008 (♀ fl.), *J. Jung 804020* (holotype, AJOU; isotype, AJOU). Figure 1.

Haec species *Trichophoro cespitoso* (L.) Hartm. similis, sed ab eo floribus nonnullis bisexualibus (planta polygama) atque achenio elliptico, ab omnibus congeneris rhizomate repente, culmo trigono atque setis hypogynis elongatis distinguitur.

Perennial, polygamous, shortly rhizomatous herb; roots fibrous; culms densely tufted, erect, glabrous, striate, 5–20 cm, 0.3–0.8 mm diam., elongating to 40 cm at maturity. Leaves reduced, ligulate, triangular to lanceolate, 1–1.5 cm; sheaths 2 or 3 per culm, aristate, membranous, awns 2–10 mm. Inflorescence of a single spikelet at culm terminus, composed of

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Figure 1. *Trichophorum dioicum* J. Jung & H. K. Choi. —A. The type *J. Jung 804020* (AJOU). —B. Habitat at the type locality (photo taken by J. Jung, 17 April 2008).

unisexual and perfect flowers, elliptic, 3.5–6.5 × 0.8–2 mm, exceeded by stigmas and anthers; spikelet with 3 to 5 florets; floral scales brown, cleft, with short awn, deciduous at maturity, 3–5.5 × 1.4–3.2 mm; stigmas trifid, 2–5 mm; stamens 3 in staminate florets and rudimentary in pistillate florets; anthers 2–3.5 mm, hypogynous bristles 6, filiform, 3–5.5 mm. Achenes brown, narrowly elliptic, trigonous, 2–3 × 0.7–0.9 mm.

Distribution and habitat. *Trichophorum dioicum* grows on limestone cliffs bordering rivers at an altitude of 300–400 m. To date, the species has been observed only from Donggang in Jeongseon-gun and Yeongwol-gun, Gangwon-do Province, South Korea.

IUCN Red List category. *Trichophorum dioicum* is known only from a single location and is therefore categorized as Vulnerable (VU D2) according to IUCN Red List criteria (IUCN, 2001).

Discussion. The new species is morphologically similar to *Trichophorum cespitosum* (L.) Hartm., but differs in its bisexuality and elliptic achenes. *Trichophorum dioicum* can be distinguished from other *Trichophorum* species in its creeping rhizome, trigonous culm, and long hypogynous bristles (Fig. 1A).

Paratypes. KOREA. **Gangwon-do:** limestone cliff area at Donggang riverside, 5 Apr. 2006 (♀ fl.), *Y. N. Lee & Y. S. Kim s.n.* (KB); *J. Jung 804015* (bisexual fl.), *804016* (♀ fl.), *806045* (fr.), *806046* (bisexual fl., fr.) (all at AJOU).

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Siphoneugena minima y *S. glabrata* (Myrtaceae), Dos Nuevas Especies de Bolivia

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Resumen. Se describen e ilustran dos nuevas especies del género *Siphoneugena* O. Berg (Myrtaceae) y se provee una clave de identificación para las especies del mismo. *Siphoneugena minima* Loza & A. Fuentes se encontró en un bosque montano del Parque Nacional Madidi y *S. glabrata* Loza & P. Jørg. en los bosques de *Alnus* Mill. de la Reserva Natural Choquetanga–Choquercamiri. Se discuten semejanzas y diferencias morfológicas entre *S. minima* con *S. delicata* Sobral & Proença y *S. reitzii* D. Legrand; la característica más marcada que distingue a *S. minima* de las demás especies es la presencia de botones y flores sésiles. *Siphoneugena glabrata* se comparó con *S. densiflora* O. Berg, *S. dussii* (Krug & Urb.) Proença y *S. occidentalis* D. Legrand, pero difiere de estas especies por presentar las ramas jóvenes glabras.

Abstract. Two new species of *Siphoneugena* O. Berg (Myrtaceae) are described and illustrated, and a key to the species of the genus is provided. *Siphoneugena minima* Loza & A. Fuentes was found in montane forest of Madidi National Park, and *S. glabrata* Loza & P. Jørg. was found in *Alnus* Mill. forests of the Choquetanga–Choquercamiri Natural Reserve. We discuss morphological similarities and differences that distinguish *S. minima* from *S. delicata* Sobral & Proença and *S. reitzii* D. Legrand; the most notable characteristic that distinguishes *S. minima* is the sessile buds and flowers. *Siphoneugena glabrata* is compared to *S. densiflora* O. Berg, *S. dussii* (Krug & Urb.) Proença, and *S. occidentalis* D. Legrand, but differs from these species by its glabrous twigs.

Key words: Bolivia, Myrtaceae, *Siphoneugena*.

La familia Myrtaceae está distribuida en todos los continentes con excepción de la Antártica, comprende aproximadamente 100 géneros y 3000 especies, siendo una de las familias más dominantes en las regiones tropicales y subtropicales (Marchiori & Sobral, 1997). El género *Siphoneugena* O. Berg pertenece a la subtribu Eugeniinae O. Berg, fue segregado de *Eugenia* L. y es aún poco estudiado (Proença, 1990).

Siphoneugena pertenece al grupo de *Plinia* que está compuesto de cuatro géneros *Neomitranthes* D. Legrand, *Siphoneugena*, *Plinia* L. y *Myrciaria* O. Berg (Lucas et al., 2007); todos tiene un ovario bilocular, los dos primeros géneros tienen dos a siete óvulos por lóculo, mientras que los dos últimos siempre presentan dos óvulos por lóculo. *Siphoneugena* puede ser reconocida por su racimo axilar o raramente terminal de una a 14 flores con un raquis reducido a alargado. El hipanto es constreñido arriba del ovario y forma una copa después de la antesis y esta copa es dehiscente cuando se desarrolla el fruto dejando una cicatriz circular en la parte superior del fruto. El ovario es bilocular con más de dos óvulos por lóculo (Proença, 1990; Sobral & Proença, 2006).

La última revisión (Proença, 1990) incluyó ocho especies, posteriormente Sobral y Proença (2006) agregaron a *Siphoneugena delicata* Sobral & Proença. *Siphoneugena* está distribuido desde Puerto Rico hasta el norte de Argentina, la mayoría de las especies concentrándose en el sudeste del Brasil. Seis especies están adaptadas a crecer en ambientes montanos por encima de los 900 m sobre el nivel del mar, dos en montañas a bajas altitudes y sólo una adaptada a vivir en hábitats de arena marítima (Proença, 1990; Sobral & Proença, 2006).

Durante el trabajo de gabinete e identificación del material coleccionado por el proyecto *Inventario Florístico de la Región Madidi* encontramos que una de las especies documentada no tenía nombre, y durante la revisión del material en LPB y MO encontramos otra especie adicional sin reconocimiento científico, las cuales se describen aquí.

1. **Siphoneugena minima** Loza & A. Fuentes, sp. nov. TYPE: Bolivia. La Paz: Franz Tamayo, Parque Nac. Madidi entre Chunkani y Tocoaque,

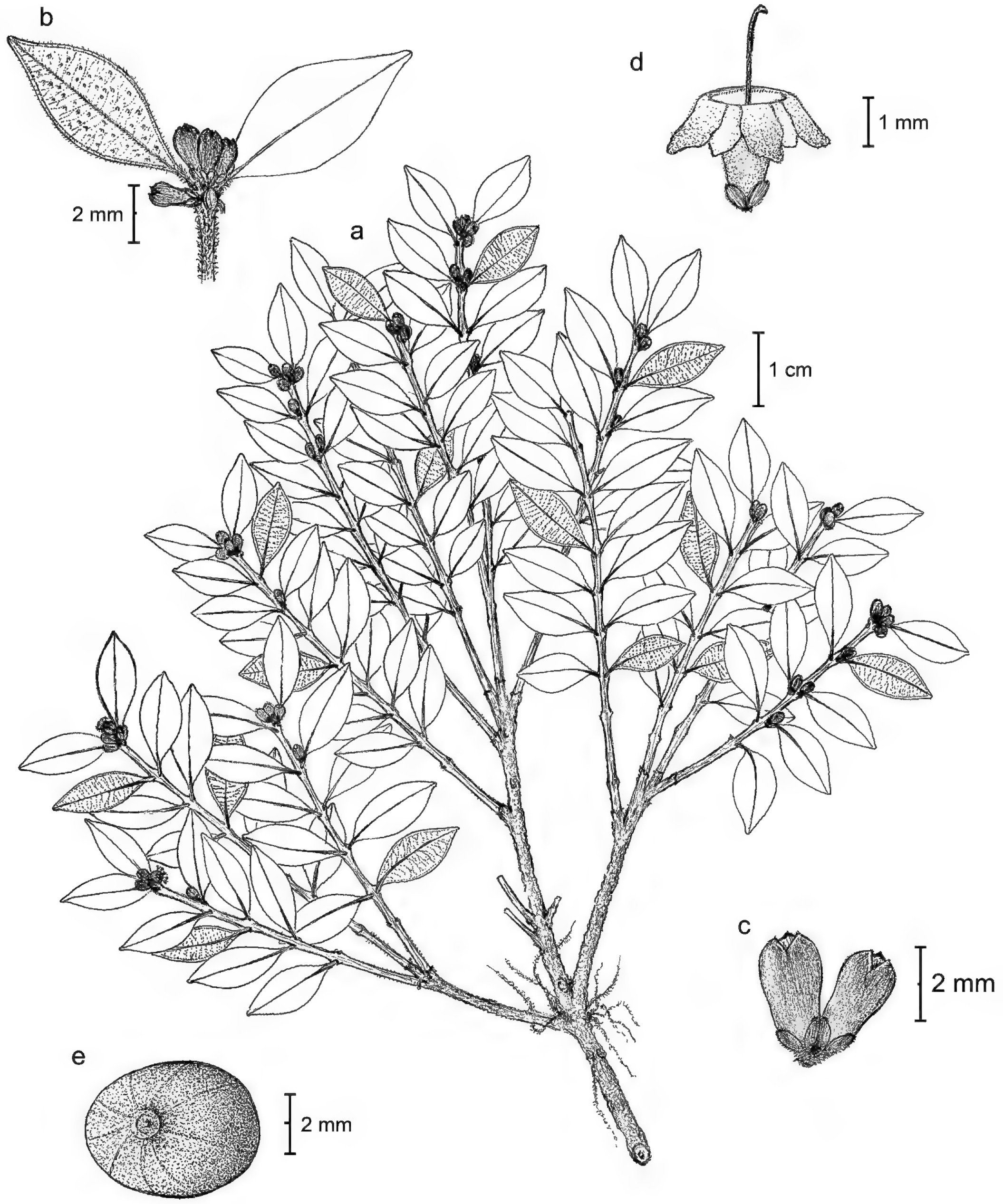

Figura 1. *Siphoneugena minima* Loza & A. Fuentes. —A. Hábito con inflorescencias axilares. —B. Hojas, vista del haz y envés con puntos translúcidos. —C. Botones. —D. Flor (los estambres salen del margen del hipanto, pero no son mostrados en la figura). —E. Fruto. A–C del paratipo *A. Fuentes et al. 8845A* (LPB); D, E del tipo, *A. Fuentes et al. 12119* (LPB).

bosque montano pluvial de filos, 14°37′51″S, 068°57′37″W, 2673 m, subarbusto 1.4 m, 27 jun. 2005, *A. Fuentes, E. Cuevas & R. Cuevas 12119* (holotipo, LPB; isotipos, MO-6016876, SEL). Figura 1.

Haec species a *Siphoneugena delicata* Sobral & Proença et *S. reitzii* D. Legrand foliorum marginibus pubescentibus, venarum secundariarum paribus plus quam sex atque floribus sessilibus differt.

Subarbusto a arbusto 1.4–2.3 m de alto; ramas cilíndricas, cuando jóvenes estrigosas, tricomas < 0.5 mm, ondulados, blanco-amarillentos, cuando maduras glabras. Hojas con puntos translúcidos; pecíolo $1.5–2.5 \times 0.4–0.5$ mm, acanalado, pubescente;

lámina 1–1.4 × 0.4–0.7 cm, elíptica; vena principal cilíndrica y muy prominente en el envés, plana y ligeramente marcada en el haz; venas secundarias 10 a 14 pares, marcadas y ligeramente prominentes en el envés, no visible en el haz; vena marginal marcadamente visible sólo en el envés, distancia de la vena marginal al margen de la lámina 0.1–0.2 mm; pubescencia solamente a lo largo de la vena principal en el haz y el envés y al margen en el haz, pubescencia blanco-amarillenta, tricomas ca. 0.5 mm, simples; base aguda, pubescente, ápice acuminado a redondeado, glabro, margen entero, divaricado a revoluto. Racimos axilares, raramente terminales, con 1 a 14 flores; raquis < 1 mm; brácteas 4, imbricadas, < 1 mm, ovadas a triangulares, margen pubescente. Botones 1–2 × 0.9–1.7 mm de diámetro, sésiles, obovoides, semi-cerrados, poco pubescentes; flores 4.5–5 mm; hipanto tubular, deciduo; lóbulos del cáliz 4, inconspicuos, < 0.3 mm, glabros; pétalos 4, ca. 1 × 1.5 mm, obovados a rectangulares, pubescentes; hipanto 1.5–1.7 mm de profundidad; estambres 50 a 55, ca. 1.3 mm, basifijos; antera ca. 0.5 × 0.3 mm, oblonga, amarillo-blanquecina; ovario ca. 0.3 × 0.2 mm, ovoide, bilocular; óvulos 2 o 3; estilo ca. 3 mm, ápice agudo, recto o con el ápice recurvado. Fruto baya, ca. 0.4 cm, ovoide.

Distribución y hábitat. *Siphoneugena minima* es un arbusto a subarbusto, que se encuentra a los 2650–2850 m en el Parque Nacional de Madidi al norte de Bolivia. Fue colectada en bosque montano pluvial con presencia de *Clusia* sp., *Cavendishia bracteata* (Ruiz & Pav. ex J. St.-Hil.) Hoerold y *Weinmannia crassifolia* Ruiz & Pav.

Categoria de la Lista Roja de UICN. *Siphoneugena minima* es solamente conocido del tipo y el parátipo, y es considerado Data Deficiente (DD; UICN, 2001) en información como para juzgar su estatus.

Etimología. El epíteto *minima* se refiere a las hojas y flores pequeñas que presenta, siendo las más pequeñas del género.

Discusión. *Siphoneugena minima* puede confundirse con *S. delicata* y *S. reitzii* D. Legrand por la hojas pequeñas que presentan las tres especies. Comparando las tres especies, *S. minima* presenta el margen de la hoja pubescente, más de seis pares de venas secundarias, botones y flores sésiles, contrastando con las otras dos especies que no tienen un margen pubescente y sus botones y flores son pediceladas. El número menor de estambres es otra característica que diferencia a *S. minima* de *S. delicata* y *S. reitzii*.

Parátipo. BOLIVIA. **La Paz:** Franz Tamayo, Parque Nac. Madidi entre Queara y Mojos, 14°38′05″S, 068°57′37″W, 2850 m, 28 feb. 2008, *A. Fuentes 8845A* (F, LPB, MO-6141062).

2. Siphoneugena glabrata Loza & P. Jørg., sp. nov. TYPE: Bolivia. La Paz: Inquisivi, Reserva Nat. Choquetanga–Choquercamiri, matorral dominado por *Pteris*, bosque de *Alnus* severamente intervenido y quemado, 16°38′S, 067°18′W, 2600 m, 22 nov. 1991, *Marko Lewis 40630* (holotipo, LPB; isotipo, MO-4041319). Figura 2.

Haec species a *Siphoneugena densiflora* O. Berg, *S. dussii* (Krug & Urb.) Proença et *S. occidentali* D. Legrand habitu fruticoso, ramis glabratis fissuratis, foliorum costa in sicco sulcata atque staminibus numerosis differt.

Arbusto; ramas jóvenes y maduras glabras; corteza generalmente lisa, ocasionalmente con fisuras. Hojas con puntos translúcidos; pecíolo 3.3–6 × 1–1.1 mm, glabro, raramente pubescente; lámina 4–6.9 × 1.4–1.9 cm, lanceolada; vena principal surcada en seco, prominente en ambas caras, glabra; venas secundarias 21 a 23 pares, prominentes en el envés, y notorias pero no muy prominentes en el haz; vena marginal prominente en el envés, poco notoria en el haz, distancia de la vena marginal al borde de la lámina ca. 0.6 mm; base aguda, glabra, ápice acuminado, glabro, margen entero, divaricado. Racimos ca. 6.3 × 6.2 mm, axilares, raramente terminales, con 3 a 6 flores; raquis ca. 0.9 mm; brácteas ca. 0.3 mm, triangulares, pubescentes. Botones florales 5–6 mm, semi-abiertos, obovados; pedicelo 0.6–1.6 mm; flores ca. 2.8 × 1.3 mm; lóbulos del cáliz 4, 1 × 1.2 mm, triangulares; pétalos 4, ca. 1.8 × 2 mm, anchos, rómbicos a ancho-trulados o ocasionalmente obtrulados, pubescentes a pilosos, tricomas simples, blancos; hipanto ca. 3.4 × 3.5 mm de profundidad; estambres 110 a 115, ca. 2.4 mm, basifijos; filamento ca. 2 mm, antera ca. 0.4 × 0.3 mm; ovario ca. 0.5 × 0.6 mm, ovoide, ínfero, bilocular; óvulos 4 o 5 por lóculo; estilo ca. 3.5 mm, ápice recurvado. Fruto desconocido.

Distribución y hábitat. *Siphoneugena glabrata* es un arbusto, que se encuentra entre los 2600 y 2750 m, en la Reserva Natural Choquetanga–Choquercamiri ubicada en la provincia Inquisivi del departamento de La Paz. Colectada en matorrales y bosques de *Alnus* Mill. intervenidos, con dominancia de especies de bosques nublados.

Categoria de la Lista Roja de UICN. *Siphoneugena glabrata* es solamente conocida del tipo y el parátipo, y es considerada Data Deficiente (DD; UICN, 2001) en información como para juzgar su estatus.

Etimología. El epíteto *glabrata* se refiere a que no presenta pubescencia en sus partes vegetativas.

Discusión. El no tener material con frutos para la descripción de *Siphoneugena glabrata* complicó un

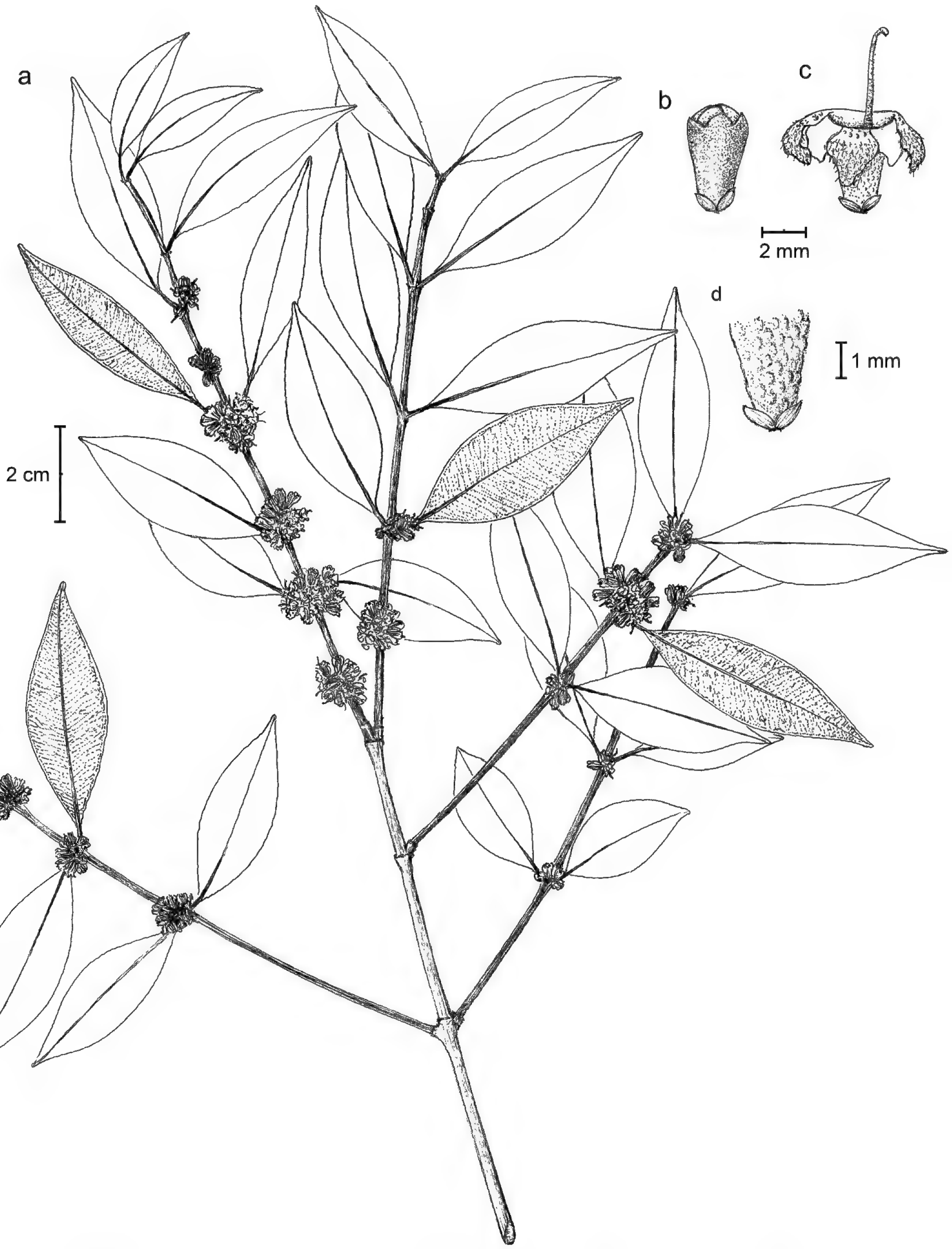

Figura 2. *Siphoneugena glabrata* Loza & P. Jørg. —A. Hábito con inflorescencias axilares. —B. Botón. —C. Flor. —D. Detalle del hipanto. A–D del tipo *M. Lewis 40630* (LPB).

poco la investigación, para distinguir entre los géneros *Siphoneugena* y *Plinia*. La diferencia entre estos dos géneros es que *Plinia* mantiene los restos de hipanto mientras que *Siphoneugena* pierde la parte apical dejando sólo una cicatriz. Sin embargo, la especie descrita pertenece claramente a *Siphoneugena* y no a *Plinia* por las siguiente observaciones: en *S. glabrata* el ovario es bilocular con cuatro o cinco óvulos por cada lóculo y no dos por lóculo como en *Plinia*, además la inflorescencia es axilar y frecuentemente

apoyada a una hoja en *S. glabrata*, y no cauliflora como ocurre en *Plinia*, y por otro lado las especies de *Plinia* son pubescentes mientras la nueva especie es glabra (Landrum et al., 2009).

Siphoneugena glabrata es morfológicamente similar a *S. densiflora* O. Berg, *S. dussii* (Krug & Urb.) Proença y *S. occidentalis* D. Legrand, pero difiere de ellas por presentar una forma de vida arbustiva, ramas glabras ocasionalmente con fisuras, la vena media es surcada en seco y claramente marcada en ambas caras. Las características morfológicas más sobresalientes de *S. glabrata* son: un número alto de estambres (a 115) y tres a seis flores por racimo, a diferencia de las otras tres especies que presentan a veces flores solitarias.

Paratipo. BOLIVIA. **La Paz:** Inquisivi, Reserva Nat. Choquetanga–Choquercamiri, 2750 m, *Marko Lewis 40616* (LPB, MO-4041318).

Proporcionamos una clave para la identificación de las especies de *Siphoneugena* que es una modificación de Proença (1990) y Sobral y Proença (2006), con la adición de *S. delicata*, *S. minima* y *S. glabrata*.

Clave para las Especies de *Siphoneugena*

1a. Botones totalmente cerrados o con un poro apical; antesis por una caliptra o por ruptura; SE de Brasil.
  2a. Raquis de la inflorescencia usualmente ausente; ovario fusiforme.
    3a. Árboles ca. 12 m; ramas jóvenes glabras; hojas 30–50 × 14–26 mm; pecíolos 2–3 × ca. 1.5 mm; vena principal prominente en ambas caras; bractéolas de ca. 1 mm que persisten después de la antesis; botones florales con un poro apical, no apiculado; estambres alrededor de 140 . . . . . *S. guilfoyleiana* Proença
    3b. Arbustos o arbolitos ca. 3 m; ramas jóvenes con tricomas de 0.1 mm; hojas 8–12 × 5–8 mm; pecíolos ca. 1 × 0.5 mm; vena principal plana poco surcada adaxialmente; bractéolas ca. 0.3 mm, deciduas en o antes de la antesis; botones florales claramente apiculados; estambres alrededor de 80. . . . . *S. delicata*
  2b. Raquis de la inflorescencia corto pero distinguible; ovario infundibuliforme.
    4a. Brácteas y bractéolas caducas (en el estado joven de botón); ovario densamente cubierto con pelos blancos . . . . . *S. kiaerskoviana* (Burret) Kausel
    4b. Algunas pocas brácteas y bractéolas persistentes (en el estado de fruto); ovario glabro o muy esparcidamente puberuloso.
      5a. Ramas jóvenes no desprendiéndose; ápice de la hoja usualmente lanceolado; botones con un poro apical sinuoso . . . . . *S. densiflora*
      5b. Ramas jóvenes usualmente desprendiéndose; ápice de la hoja usualmente redondeado; botones cerrados o con un poro apical pequeño redondeado . . . . . *S. widgreniana* O. Berg
1b. Botones abiertos; antesis por 4 apreciables lóbulos en el cáliz (algunas rupturas pueden ocurrir); Sudamérica y el Caribe.
  6a. Estambres más de 170; raquis del racimo usualmente ausente . . . . . *S. kuhlmannii* Mattos
  6b. Estambres menos de 140; raquis del racimo usualmente corto pero distinguible.
    7a. Estambres 50 a 55; botones y flores sésiles; Bolivia . . . . . *S. minima*
    7b. Estambres más de 60; botones y flores pediceladas.
      8a. Ramas glabras ocasionalmente con fisuras; vena principal de la hoja surcada hacia la base; estambres 110 a 115; Bolivia . . . . . *S. glabrata*
      8b. Ramas pulverulentas a pubescentes; vena principal de la hoja no surcada.
        9a. Bractéolas deciduas después de la floración; estambres ca. 70; Argentina, Bolivia, Brasil central (Mato Grosso). . . . . *S. occidentalis*
        9b. Algunas pocas bractéolas persistentes en los frutos; centro y sur del Brasil, Venezuela, Guyanas, Surinam, Caribe.
          10a. Pecíolos normalmente de 3–14 mm; estambres 60 a 110; corteza rugosa y fisurada . . . *S. densiflora*
          10b. Pecíolos normalmente de 1–6 mm; corteza lisa.
            11a. Ápice de la hoja usualmente acuminado; estambres ca. 100; Brasil central, Venezuela, Surinam, Guyana, Caribe. . . . . *S. dussii*
            11b. Ápice de la hoja usualmente agudo; estambres 70 a 85; hacia el sur de Brasil . . . *S. reitzii*

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Typification of Names in Nine Species of *Arctotis* (Asteraceae, Arctotideae) from the Succulent Karoo, South Africa

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Abstract. In preparation for the treatment of *Arctotis* L. (Asteraceae) in the upcoming *Conspectus of the Trans-Cape Succulent Karoo Flora of South Africa*, the typification of names and synonymy for nine *Arctotis* species that occur within the Succulent Karoo region, South Africa, are clarified. The author citation for *A. argentea* is corrected from Thunb. to *A. argentea* Aiton, and the lectotype is selected. In addition, lectotypes are designated for *A. auriculata* Jacq., *A. campanulata* DC., *A. campanulata* var. *puberula* DC., *A. canescens* DC., *A. cineraria* Jacq., *A. cuprea* Jacq., *A. denudata* Thunb., *A. diffusa* Thunb., *A. fastuosa* Jacq., *A. flaccida* Jacq., *A. flammea* Jacq., *A. glabrata* Jacq., *A. laevis* Thunb., *A. leucanthemoides* Jacq., *A. maximilianii* Schltr. ex Beauverd, *A. pusilla* DC., *A. revoluta* Jacq., *A. rosea* Jacq., *A. squarrosa* Jacq., *A. venidioides* DC., and *Venidium aureum* DC.

Key words: Arctotideae, Arctotidinae, *Arctotis*, Asteraceae, Compositae, South Africa.

Arctotis L. is the largest genus in the subtribe Arctotidinae, comprising approximately 60 to 70 species, and is widely distributed in southern Africa (Karis et al., 2009). The main center of taxonomic diversity of the genus is in the winter rainfall region of southern Africa. The taxonomy of *Arctotis* is especially chaotic. Some of the many taxonomic and nomenclatural problems have been resolved (McKenzie et al., 2006, 2008a, b; McKenzie & Barker, 2007), but many names are still in need of typification. In preparation for the treatment of *Arctotis* in the upcoming *Conspectus of the Trans-Cape Succulent Karoo Flora of South Africa* (Snijman, in prep.), we herein clarify the synonymy and typification of names for nine *Arctotis* species that occur within the geographic area of southern Africa defined by Jürgens (1991) as the Succulent Karoo region. This region approximately corresponds to the part of the winter rainfall region that experiences the greatest summer aridity.

Lectotypification of *Arctotis argentea*

The name *Arctotis argentea* is usually attributed to Thunberg (1799). However, the name was validly published by Aiton (1789), who recorded the introduction of the species to the Royal Botanic Gardens, Kew, by Francis Masson in 1774. Masson accompanied Thunberg on collecting expeditions into the interior of the Cape colony in 1773 and 1774 (Gunn & Codd, 1981). Although the descriptions for new names published by Aiton (1789) were prepared mainly by D. Solander and edited and amended by J. C. Dryander (Stafleu & Cowan, 1976), under Article 46.7 of the *International Code of Botanical Nomenclature* (ICBN; McNeill et al., 2006) the name *A. argentea* must be attributed to Aiton.

A sheet in the Herbarium of the Natural History Museum, London (BM), is annotated in pencil "*Arctotis argentea*, Thb." and a label is attached bearing the inscription "Hort. Kew. 1777—Sem. E Cap. bon. Spei." Thus the specimen was prepared from material cultivated at Kew, and because its preparation post-dates the recorded introduction of *A. argentea* to Kew in 1774 and precedes publication of the description in Aiton (1789), this sheet is suitable for designation as the lectotype for *A. argentea*. The specimen is consistent with the morphological descriptions of Aiton (1789) and Thunberg (1799).

Arctotis argentea Aiton, Hort. Kew. 3: 273. 1789. TYPE: [South Africa.] Cape of Good Hope: Hort. Kew. Sem. E Cap. bon. spei [Hortus Kewensis semen e Capite bonae spei], 1777, s. coll. (lectotype, designated here, BM).

Lectotypification of *Arctotis auriculata*

Arctotis auriculata Jacq. is a robust, showy species from the Namaqualand region of northwestern South Africa. The species was described by Jacquin (1797). A single sheet (W 0006633) in the Naturhistorisches Museum Herbarium, Vienna (W), formerly in the Jacquin Herbarium, is annotated as *A. auriculata* and was designated the lectotype of this name on the sheet by Tycho Norlindh in 1980, but the typification was never published. The material agrees with the description and illustration in Jacquin (1797) and is herein formally designated the lectotype of *A. auriculata* Jacq.

The name *Arctotis flammea* Jacq., published by Jacquin (1809), is a synonym of *A. auriculata*. However, no original material formerly in the Jacquin Herbarium has been located. Therefore, the illustration of *A. flammea* in Jacquin (1809), which agrees with Jacquin's description in all important features, is designated the lectotype of *A. flammea*.

Arctotis auriculata Jacq., Pl. Rar. Hort. Schoenbr. 2: 22, tab. 169. 1797. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

Arctotis flammea Jacq., Fragm. Bot. 41, tab. 47. 1809, syn. nov. TYPE: "*Arctotis flammea*" in Jacquin, Fragm. Bot., tab. 47. 1809 (lectotype, designated here, Jacquin, 1809: tab. 47).

Lectotypification of *Arctotis campanulata*

De Candolle (1838) described *Arctotis campanulata* DC., of which he distinguished two varieties (*A. campanulata* α *subtomentosa* DC. and β *puberula* DC.). De Candolle did not list the corresponding autonym (*A. campanulata* var. *campanulata*). Under Article 26.2 of the ICBN (McNeill et al., 2006), since no type was indicated for *A. campanulata* DC., both varietal names were validly published. Under Article 26.3, the valid publication of the varietal names automatically established the autonym (*A. campanulata* var. *campanulata*). The species *A. campanulata* requires lectotypification from among the specimens cited for each variety, which are therefore syntypes of *A. campanulata*.

De Candolle (1838: 485) stated that for both varieties he examined material collected by Drège in "Klein Namaqualand." In G-DC, two plants from the gathering *Drège 6162* are mounted on a sheet labeled "*Arctotis campanulata* α *subtomentosa*," and on a separate sheet a single plant of the gathering *Drège 2749* is labeled "*Arctotis campanulata* β *puberula*." Duplicate sheets of *Drège 2749* and *6162* are lodged in the Herbarium of the Muséum national d'Histoire naturelle, Paris (P). Additional material annotated as each variety, collected by Drège but lacking collector's numbers, are lodged in the Herbarium in G, Kew Herbarium (K), Missouri Botanical Garden Herbarium (MO), and the National Herbarium, Pretoria (PRE).

De Candolle (1838) distinguished the two varieties based on leaf pubescence and leaf lobe apex shape. Although *Arctotis campanulata* has been recognized in most subsequent treatments, its morphological characterization and discrimination from *A. acaulis* are problematic, and in herbaria the name has been applied to specimens belonging to several species. *Arctotis acaulis* is a very polymorphic species, varying particularly in leaf shape and dissection, and leaf and involucral bract pubescence. An investigation of the entire *A. acaulis* species complex is in progress. Pending the outcome of this investigation, the taxonomic recognition of *A. campanulata* is retained.

The duplicate of *Drège 2749* in G-DC is herein designated the lectotype for *Arctotis campanulata* var. *puberula*. In morphology *A. campanulata* var. *puberula* is dubiously distinct from *A. acaulis* L. and might ultimately be placed in synonymy of that name, whereas *A. campanulata* var. *subtomentosa* is more disparate in morphology and appears to be specifically distinct from *A. acaulis*. Therefore, with nomenclatural stability in mind, the sheet *Drège 6162* in G-DC is selected as the lectotype of *A. campanulata* DC.

On isolectotype sheets in P, the provenance of *Drège 2749* is stated to be Mierenkasteel, the farm now known as Meerhofkasteel located southwest of Bitterfontein, Western Cape (Gunn & Codd, 1981), and the origin of *Drège 6162* is specified as Haazenkraalsrivier. The collector's numbers *2749* and *6162* were not specified by Drège (1843), but he recorded collecting *A. campanulata* from "Haazenkraalsrivier, am Fluss und auf der Höhe daselbst," 600–760 m, "zwischen Uitkomst und Geelbekskraal," 600–900 m, and "bei Mierenkasteel, karrooartige Höhe," 300–600 m (Drège, 1843: 94, 96).

Arctotis campanulata DC., Prodr. 6: 485. 1838. *Arctotis campanulata* var. *subtomentosa* DC., Prodr. 6: 485. 1838, syn. nov. TYPE: South Africa. Northern Cape: Haazenkraalsrivier, 450–600 m, 24 Aug. 1830, *J. F. Drège 6162* (lectotype, designated here, G-DC; isotypes, P).

Arctotis campanulata var. **puberula** DC., Prodr. 6: 485. 1838. TYPE: South Africa. Western Cape: "bei Mierenkasteel," 300–600 m, 6 Aug. 1830, *J. F. Drège 2749* (lectotype, designated here, G-DC; isotypes, P).

Lectotypification of *Arctotis canescens* and *A. diffusa*

De Candolle (1838) described *Arctotis canescens* DC. from two gatherings by Drège: *Drège 671* from the Kamdeboberg and *Drège 6161* from the Khamiesberg. The gatherings are of two distinct *Arctotis* species. The *Drège 671* gathering was of the species previously named by Thunberg (1799) as *A. diffusa* Thunb. The *Drège 6161* specimen is of a species not formally linked to a name previously.

Arctotis canescens and *A. diffusa* are readily distinguishable based on morphology and ecology (R. J. McKenzie, unpublished). A sheet in the Thunberg Herbarium (UPS-THUNB 20766), annotat-

ed "*Arctotis diffusa*" and consistent with Thunberg's (1799) description, is designated herein as the lectotype of *A. diffusa*. Designation of *Drège 671* as the lectotype of *A. canescens* would result in the placement of the name as a synonym of *A. diffusa* and require publication of a new name for the species represented by *Drège 6161*. Therefore, *Drège 6161* is herein designated as the lectotype of *A. canescens*.

Arctotis canescens DC., Prod. 6: 485. 1838. TYPE: South Africa. Northern Cape: Kamiesberg, Roodeberg, Gydokap, s.d., *J. F. Drège 6161* (lectotype, designated here, G-DC).

Arctotis diffusa Thunb., Arctotis: 9. 1799. TYPE: South Africa. "Promontorio bonae spei Africes," s.d., *C. P. Thunberg s.n.* (lectotype, designated here, UPS-THUNB).

Lectotypification and Synonymy of *Arctotis fastuosa*

Arctotis fastuosa Jacq. is one of the major components of the famous spring-flowering annual Namaqualand daisies. The species was described by Jacquin (1797) from material cultivated in the gardens of the Schönbrunn Palace in Vienna. The original provenance of the plants was stated as "ex Promontorium bonae spei." One sheet formerly in the Jacquin Herbarium annotated as *A. fastuosa* is lodged at W and can be considered as the lectotype. The species varies greatly in size and leaf morphology and pubescence, but possesses distinctive achenes (see McKenzie et al., 2005). In the present study, four additional names were confirmed to be based on specimens of *A. fastuosa*, namely *A. maximilianii* Schltr. ex Beauverd, *A. mirabilis* Dümmer, *Venidium aureum* DC., and *V. wyleyi* Harv. Hoffmann (1910: 313) listed the names "*A. Wybi* (Harv.) O. Hoffm.—*Venidium Wybi* Harv., l.c., p. 463," which was clearly intended to be *V. wyleyi* of Harvey (1865) and Hoffmann's new combination *A. wyleyi*; this can be treated as a typographic error requiring correction rather than Hoffmann (1910) publishing a new name.

Arctotis fastuosa Jacq., Pl. Rar. Hort. Schoenbr. 2: 20, tab. 166. 1797. *Venidium fastuosum* (Jacq.) Stapf, Bot. Mag. 152: tab. 9127. 1928. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

Venidium aureum DC., Prodr. 6: 494. 1838. *Arctotis aurea* (DC.) Beauverd, Bull. Soc. Bot. Genève, Sér. 2, 7: 44. 1915, non *Arctotis aurea* Burm. f., 1768, nom. illeg. TYPE: South Africa. Northern Cape: "zwischen Zwartdoornrivier und Groenrivier," 12 Aug. 1830, *J. F. Drège 2739* (lectotype, designated here, G-DC; isotypes, P).

Venidium wyleyi Harv. in Harv. & Sond., Fl. Cap. 3: 463. 1865. *Arctotis wyleyi* (Harv.) O. Hoffm., Ann. Nat. Hofmus. Wien 24: 313. 1910, as "*wybi*." TYPE: South Africa. Namaqualand, s.d., *A. Wyley s.n.* (holotype, TCD).

Arctotis mirabilis Dümmer, J. Roy. Hort. Soc. 40: 81. 1914. TYPE: South Africa. Little Namaqualand: Klipfontein, May 1902, *E. Foxwell s.n.* (holotype, K).

Arctotis maximilianii Schltr. ex Beauverd, Bull. Soc. Bot. Genève, Ser. 2, 7: 49. 1915. TYPE: South Africa. Namaqualand: Zabies, 12 July 1897, *M. Schlechter s.n.* (lectotype, designated here, K; isotypes, BR, HBG, P).

Lectotypification and Synonymy of *Arctotis flaccida*

Arctotis flaccida Jacq. and *A. leucanthemoides* Jacq. were described by Jacquin (1797) from plants with an annual life history cultivated in the gardens of the Schönbrunn Palace in Vienna. The original provenance of the plants was stated to be "ex Promontorium bonae spei" (Jacquin, 1797: 19). Two sheets formerly in the Jacquin Herbarium annotated as *A. flaccida* and *A. leucanthemoides*, respectively, are lodged in W and can be considered as the respective lectotypes. Close examination of the specimens, focusing on the leaf morphology and arrangement, particularly that of the upper leaves, and immature achene and pappus morphology proved that the two names apply to the same species. The name *A. flaccida* is an appropriate allusion to the thin, precociously wilting nature of the leaves of this species and, consequently, this name is here selected as the valid name for the species.

De Candolle (1838) described two species, *Arctotis pusilla* DC. and *A. venidioides* DC., based on two separate Drège gatherings from the Olifantrivier area in the Western Cape. Previous authors have shown uncertainty in applying the two names but, based on the above-mentioned morphological features and the specimens' provenances, the names clearly apply to the same species as the names *A. flaccida* and *A. leucanthemoides*. The name *A. pusilla* was applied to a young plant that had a shortly caulescent habit and predominantly rosulate leaves. In contrast, the names *A. flaccida*, *A. leucanthemoides*, and *A. venidioides* were based on older plants in which lateral flowering stems with elongated internodes had developed.

A further name, *Arctotis gowerae* E. Phillips, which was based on plants grown from seeds collected in the Vanrhynsdorp district (Phillips, 1927), also applies to the same taxon and is herein placed in synonymy of *A. flaccida*. *Arctotis gowerae* has previously been considered to be a synonym of *A. fastuosa*, but differs from that species in leaf morphology and arrangement and the presence of a pappus of rudimentary scales. The holotype of *A. gowerae* is a single flowering lateral branch; the robust size reflects its horticultural origin.

Beyers (2000) placed *Arctotis semipapposa* (DC.) Beauverd as a synonym of *A. flaccida* without

comment, but such a treatment is erroneous (McKenzie et al., 2008b).

Arctotis flaccida Jacq., Pl. Rar. Hort. Schoenbr. 2: 19, tab. 163. 1797. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

Arctotis leucanthemoides Jacq., Pl. Rar. Hort. Schoenbr. 2: 19, tab. 164. 1797, syn. nov. *Ursinia leucanthemoides* (Jacq.) Poir., Encycl. 8: 258. 1808, as "*leucanthemifolia*." *Lycotis leucanthemoides* (Jacq.) Hoffmanns., Verz. Pfl.-Nachtr. 2: 99. 1826. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

Arctotis pusilla DC., Prodr. 6: 489. 1838, syn. nov. TYPE: South Africa. Western Cape: "bei Olifantrivier, auf karrooartigen Höhen," under 1000 ft., s.d., *J. F. Drège 2740* (lectotype, designated here, G-DC).

Arctotis venidioides DC., Prodr. 6: 489. 1838, syn. nov. TYPE: South Africa. Western Cape: "Olifantrivier, Ebenezar, auf steinigen, trocknen (karrooartigen) Hügeln," under 500 ft., s.d., *J. F. Drège 6164* (lectotype, designated here, G-DC; isotypes, P).

Arctotis gowerae E. Phillips, Fl. Pl. South Africa 7: tab. 241. 1927, syn. nov. TYPE: South Africa. Western Cape: "Vanrhynsdorp dist., grown at the Division of Botany from seeds supplied by Mrs E. Rood," June 1924, *E. Phillips 6036* (holotype, PRE).

Lectotypification and Synonymy of *Arctotis revoluta*

The species generally known as *Arctotis revoluta* Jacq. is a widespread element of the *A. aspera* L. species complex and is distributed in Namaqualand and the Western Cape. The complex is morphologically diverse and taxonomically difficult, with a number of the forms receiving names at the species and variety levels. Resolution of taxa within the complex is one focus of an ongoing investigation. In the interim, forms with often secondarily pinnatisect leaves with narrow pinnae and revolute margins, and a distinctly shrubby, erect habit, are treated as a distinct species, *A. revoluta*, and names placed in its synonymy are herein typified. The leaf pubescence is extremely variable, but always includes a dense covering of short glandular trichomes, and may also bear moderately dense gray woolly tomentum and/or scabrid multiseptate trichomes. It must be noted that the name *A. aspera* var. *undulata* P. J. Bergius and the combination *A. undulata* (P. J. Bergius) Gaertn. may apply to this taxon and, if correct, would have nomenclatural priority over the name *A. revoluta*.

Four names published by Jacquin (1797, 1798), namely *Arctotis cineraria* Jacq., *A. cuprea* Jacq., *A. glabrata* Jacq., and *A. squarrosa* Jacq., are here treated as conspecific and synonyms of *A. revoluta*. Specimens labeled as *A. cuprea*, *A. glabrata*, and *A. squarrosa*, formerly in the Jacquin Herbarium and prepared from material cultivated in the gardens of the Schönbrunn Palace, are lodged in W and thus can be considered as the respective lectotypes. The sheet in W (W 0006631), annotated as *A. cuprea* Jacq., was designated the lectotype of *A. cuprea* by Tycho Norlindh in 1980, but the typification was never published. No such specimen labeled as *A. cineraria* is extant in W. However, a specimen collected by J. Banks from "Capite bonae spei," formerly in the Jacquin Herbarium and annotated "*Arctotis* (*aspera*) *cineraria* Jacquin," is lodged in W. Jacquin (1797) gave no indication of seeing a gathering by Banks in the protologue of *A. cineraria*, so it cannot be assumed that the specimen formed part of the original material. In the absence of an extant specimen prepared from material cultivated in the Schönbrunn garden, the illustration of *A. cineraria* accompanying the protologue in Jacquin (1797) is herein designated the lectotype for *A. cineraria*.

Arctotis revoluta Jacq., Pl. Rar. Hort. Schoenbr. 2: 24, tab. 173. 1797. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

Arctotis cineraria Jacq., Pl. Rar. Hort. Schoenbr. 2: 24, tab. 174. 1797, syn. nov. TYPE: "*Arctotis cineraria*" in Jacquin, Pl. Rar. Hort. Schoenbr. 2: tab. 174. 1797 (lectotype, designated here, Jacquin, 1797: tab. 174).

Arctotis glabrata Jacq., Pl. Rar. Hort. Schoenbr. 2: 25, tab. 175. 1797, syn. nov. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

Arctotis cuprea Jacq., Pl. Rar. Hort. Schoenbr. 2: 25, tab. 176. 1797, syn. nov. *Arctotis aspera* var. *cuprea* (Jacq.) DC., Prodr. 6: 488. 1838. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

Arctotis squarrosa Jacq., Pl. Rar. Hort. Schoenbr. 2: 25, tab. 177. 1797, syn. nov. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

Arctotis laevis Thunb., Arctotis: 10. 1799, syn. nov. TYPE: [South Africa.] "Ex Promontorio bonae spei," s.d., *C. P. Thunberg s.n.* (lectotype, designated here, UPS-THUNB).

Arctotis denudata Thunb., Arctotis: 14. 1799, syn. nov. TYPE: [South Africa.] "Ex Promontorio bonae spei," s.d., *C. P. Thunberg s.n.* (lectotype, designated here, UPS-THUNB).

Arctotis crispata Hutch., A Botanist in Southern Africa: 158. 1946, adnot., syn. nov. TYPE: South Africa. Northern Cape: Kamieskroon, 14 Oct. 1928, *J. Hutchinson 845* (holotype, K; isotypes, BOL, PRE).

Lectotypification of *Arctotis rosea*

Arctotis rosea Jacq. is a poorly known species described by Jacquin (1797) from a plant "ex Promontorio bonae spei" cultivated in the gardens of the Schönbrunn Palace, Vienna. The species is

closely allied to *A. acaulis*, but differs in possessing a shortly caulescent habit, moderate woolly indumentum equally on the adaxial and abaxial leaf surfaces, an acute leaf apex, and a dark red ray floret limb. Mature achenes have not been seen. A sheet in W (W 0006615) formerly lodged in the Jacquin Herbarium and annotated "*Arctotis rosea* Jacq." agrees with the illustration and description of *A. rosea* published by Jacquin (1797) and is herein designated the lectotype of *A. rosea*.

Arctotis rosea Jacq., Pl. Rar. Hort. Schoenbr. 2: 18, tab. 162. 1797. TYPE: [South Africa.] Hort. Schönbr. [Hortus Schoenbrunnensis], s.d., s. coll. (lectotype, designated here, W).

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Hydrocotyle apolobambensis (Apiaceae), una Especie Nueva Andina del Noroeste de Bolivia

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Resumen. Se describe e ilustra *Hydrocotyle apolobambensis* M. Mend. & A. Fuentes (Apiaceae), una nueva especie de hojas trifolioladas, restringida a la cordillera de Apolobamba, en la cuesta oriental del noroeste de Bolivia. La especie es similar a *H. palmata* Mathias con la que comparte su área distribución natural, pero difiere de ella por tener un menor número de flores, pedicelos pubescentes, lóbulos de las hojas redondeados a obtusos y el indumento piloso. Se adiciona una clave y una tabla comparativa para distinguirla de otras especies trifolioladas de *Hydrocotyle* L. de América del Sur.

Abstract. *Hydrocotyle apolobambensis* M. Mend. & A. Fuentes (Apiaceae), a new species with trifoliolate leaves restricted to the eastern slopes of the Apolobamba mountain range in northwestern Bolivia, is described and illustrated. The species is similar to *H. palmata* Mathias, with which it shares sympatric distribution, but differs by having fewer flowers per umbel, pubescent pedicels, rounded to obtuse leaf lobes, and pilose indumentum. A key and a comparative table to distinguish the new species from other trifoliolate *Hydrocotyle* L. species of South America are included.

Key words: Apiaceae, Apolobamba, Bolivia, *Hydrocotyle*, IUCN Red List, Madidi National Park.

La región de Madidi que incluye a las áreas protegidas de Apolobamba, Madidi, Pilón Lajas y alrededores, al norte del departamento de La Paz, es la zona más diversa de Bolivia, con un estimado que supera las 8000 especies de plantas vasculares (Jørgensen et al., 2005). En los últimos cinco años se ha trabajado en la elaboración de un inventario florístico que incluye colecciones intensivas en los distintos ecosistemas que se encuentran en la región. Como parte de los resultados de este importante proyecto se están encontrando y describiendo nuevas especies de plantas. El sector situado entre las localidades de Pelechuco-Keara y Puina es uno de los menos conocidos y estudiados, y es a su vez de donde se registra un importante número de especies nuevas para la ciencia (Fuentes, datos sin publicar), entre las cuales se encuentra la que aquí proponemos.

Hydrocotyle apolobambensis M. Mend. & A. Fuentes, sp. nov. TYPE. Bolivia. La Paz: Prov. Franz Tamayo, Keara Viejo, ca. 200 m al sur de la iglesia del pueblo, al lado del río Orcochipata, 14°42′29″S, 69°05′05″W, 3492 m, 14 abr. 2006, *M. Mendoza, A. Fuentes & M. C. López 2062* (holotipo, USZ; isotipos, K, LPB, MO, NY, US). Figura 1.

Haec species *Hydrocotylae palmatae* Mathias affinis, sed ab ea foliolis trilobis margine inciso-lobulatis mucronatisque, pedunculis petiolos longe excedentibus, umbellis 10- ad 15-floris atque pedicellis pubescentibus vel sub fructu raro glabris distincta.

Hierba perenne, 5–10(–15) cm de alto, delicada; tallos rastreros, ascendentes a colgantes, glabros o con escasos pelos cerca a los nudos, 0.5–0.7 mm diám., nudos radicantes, entrenudos 1–8 cm; estípulas envolventes, anchamente ovadas, margen entero y levemente ondulado. Hojas largamente pecioladas; pecíolos 5–12(–16) cm, densamente pilosos en la inserción con la lámina, gradualmente glabrescente hacia la base; láminas emarginadas, 1.2–3.5(–4.5) cm diám., 3-folioladas, aparentemente 5-folioladas por incisión profunda en los folíolos laterales; folíolos 3-lobados hasta en segundo orden; margen inciso-lobulado y mucronado; estrigoso-pilosos en ambas caras, con pelos alargados principalmente en los

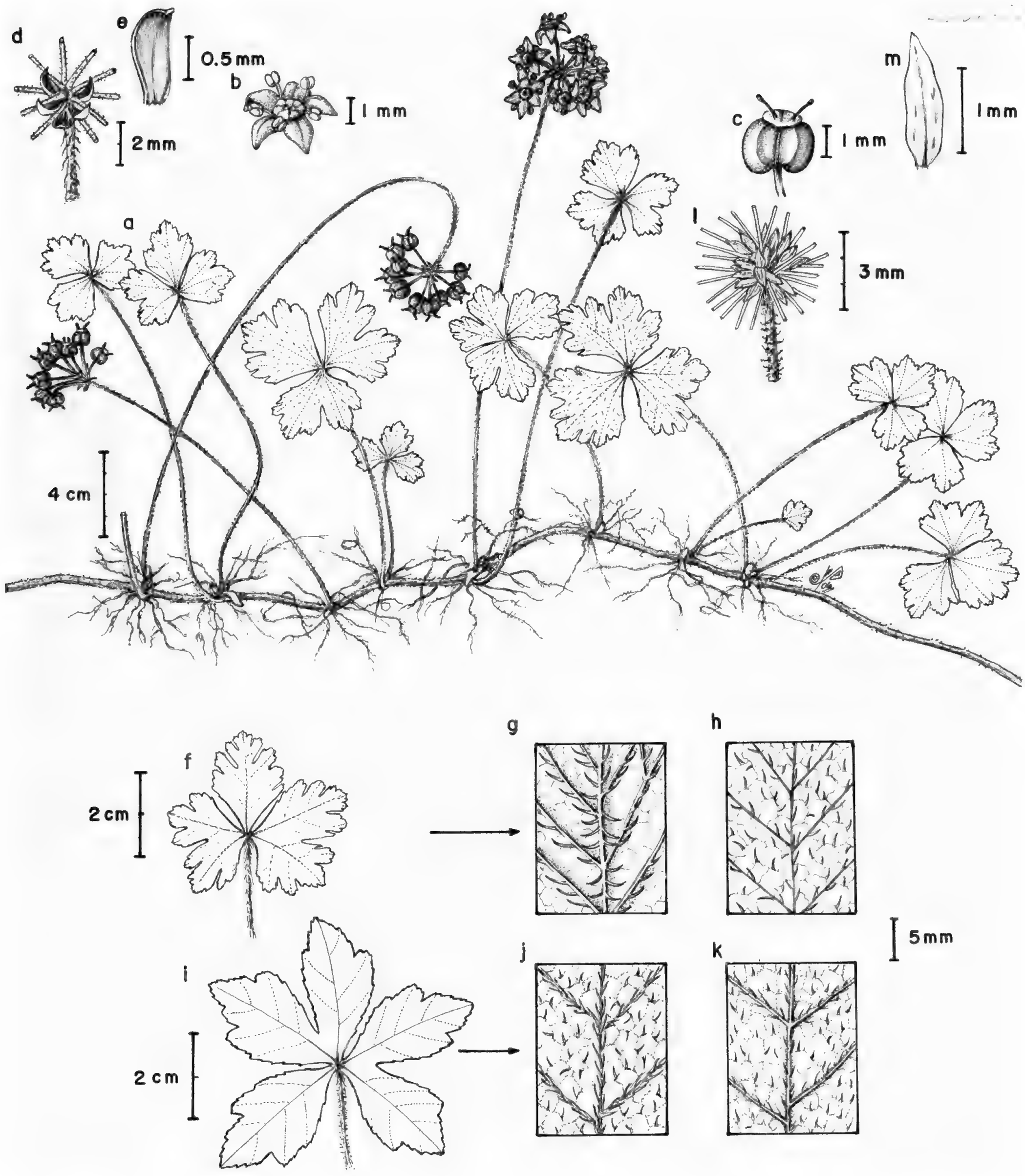

Figura 1. A–H. *Hydrocotyle apolobambensis* M. Mend. & A. Fuentes. —A. Hábito. —B. Flor. —C. Fruto. —D. Brácteas y pedicelos. —E. Bráctea. —F. Hoja. —G. Detalle hoja, envés. —H. Detalle hoja, haz. I–M. *Hydrocotyle palmata* Mathias. —I. Hoja. —J. Detalle hojas, envés. —K. Detalle hoja, haz. —L. Brácteas y pedicelos. —M. Bráctea. A–H de *M. Mendoza, A. Fuentes & M. C. López 2062* (USZ); G–M de *A. Sagástegui, E. Alvitez & J. Mostacedo 9509* (MO). Dibujo de Carlos Maldonado.

nervios. Umbelas simples 10- a 15-floras; pedúnculos opuestos a los pecíolos, 6–12(–18) cm, densamente estrigoso-pilosos en la parte superior y glabrescentes hacia la base; pedicelos esparcidamente pubescentes a rara vez glabros en individuos con frutos maduros; brácteas cóncavas, una por pedicelo, ovado-lanceoladas, ápice atenuado, enteras. Flores con pétalos triangular-ovados a -lanceolados, reflexos, de color rojo vino, el nervio central marcado; filamentos cortos, ca. 0.5 mm, robustos, verdes, claros; anteras amarillas; estilos reducidos y rectos, de menos 0.4 mm. Frutos reniformes comprimidos lateralmente, base emarginada, ca. 1.5 × 2 mm diám., glabros, verdes a manchados de rojo vino; costillas dorsales promi-

Tabla 1. Diferencias entre *Hydrocotyle apolobambemsis* y otras especies con hojas trifolioladas en Sudamérica.

Caracteres	*H. apolobambensis*	*H. palmata*	*H. minutifolia*
Hojas	1.2–3.5(–4.5) cm diám.	4–10 cm diám.	0.4–0.8 cm diám.
Foliolos	3-lobados, lóbulos lobados hasta en segundo orden, margen inciso-lobulado y mucronado	3-lobados, lóbulos lanceolado-cuneados, margen inciso-dentado, dientes ciliados	2- a 4-lobados, lóbulos obtuso-mucronados
Umbelas	10 a 15 flores	30 a 40 flores	4 flores
Pedúnculos	Sobrepasando a los pecíolos, 6–12(–18) cm de largo, glabrescente en la base e hirsutos en el ápice	No sobrepasando a los pecíolos, 4–5 cm de largo, hirsutos	Sobrepasando a los pecíolos, 3–5 cm de largo, glabros
Pedicelos	3–5 mm largo, pubescentes o rara vez glabros en individuos con frutos maduros	3–6 mm largo, totalmente glabros	1–2 mm largo, glabros

nentes, costillas intermedias filiformes; estilopodios planos; estilos persistentes y divaricados ca. 1 mm.

Distribución y hábitat. La especie se conoce solamente de un pequeño sector en el área de la comunidad de Keara (al noreste de Pelechuco), por el camino de herradura hacia Mojos, en el límite entre las áreas protegidas de Apolobamba y Madidi al noroeste del departamento de La Paz y por lo tanto es endémica de Bolivia. Fisiográficamente ocupa las laderas orientales de la cordillera de Apolobamba, en un sector que es parte de las nacientes del río Tuichi. Crece principalmente sobre rocas y bases de árboles, entre detritos vegetales en el sotobosque del bosque bajo de yungas del piso de la ceja de monte inferior pluvial junto con especies arbóreas de *Weinmannia* L. (*W. fagaroides* Kunth), *Gynoxys* Cass., *Oreopanax* Decne. & Planch., *Escallonia* Mutis ex L. f. (*E. myrtilloides* var. *patens* (Ruiz & Pav.) Sleumer), *Myrsine* L. y *Symplocos fimbriata* B. Ståhl; en áreas muy húmedas con frecuente influencia de nieblas. Biogeográficamente el área de distribución de esta especie es parte de la provincia de los Yungas Peruano-Bolivianos, región Andina (Navarro, 2002).

Etimología. El nombre de la especie hace alusión a la zona geográfica de Apolobamba, entre las áreas protegidas Apolobamba y Madidi, sitio en el cual crece el taxón aquí descrito.

Discusión y Categoria de la Lista Roja de UICN. La especie más parecida a *Hydrocotyle apolobambensis* es *H. palmata* Mathias (sin *H. macbridei* Mathias & Constance), ya que ambas especies presentan las hojas trifolioladas con aspecto general similar, pero difieren en el tamaño, el margen y en la presencia de cilios o mucrones, que las diferencian claramente (Tabla 1). La inflorescencia de *H. palmata* cuenta con 30 a 40 flores por lo que presenta umbelas más robustas y ligeramente más grandes, los pedicelos son glabros, y los pedúnculos florales 4–5 cm de largo, pudiendo ser mayores o menores en longitud a sus pecíolos. En cambio la inflorescencia de *H. apolobambensis* presenta 10 a 15 flores, sus pedicelos son pubescentes y los pedúnculos florales 6–12(–18) cm sobrepasando a los pecíolos de las hojas.

Hydrocotyle palmata tiene una distribución andina y restringida a Perú (Mathias, 1936; Mathias & Constance, 1957, 1962) y Ecuador (<http://www.tropicos.org/NameSpecimens.aspx?nameid=1701327>). De acuerdo con la información disponible, podemos concluir que *H. apolobambensis* es endémica de las laderas orientales de la cordillera de Apolobamba, en el departamento de La Paz, Bolivia, pero dada su cercanía geográfica y la similitud de sustrato geológico y de ecosistemas con el Perú, es posible que la especie se encuentre también en este país. Así mismo, no se estudió suficientemente a la nueva especie y sus poblaciones naturales, según criterios de UICN (2001) se la propone como Datos Insuficientes (DD) al no contar con buena información para fundamentar una categoría de listas rojas más exacta a este taxón.

Otra especie también parecida a *Hydrocotyle apolobambensis* aunque más fácil de distinguir es *H. minutifolia* Rose, que se caracteriza por su reducido tamaño, con hojas de apariencia trifoliolada, pero realmente dos a cuatro lobadas, 0.4–0.8 cm de diámetro, sus inflorescencias reducidas a cuatro flores con los pedicelos glabros y los pedúnculos florales emergentes, 3–5 cm de largo. A esto se suma su distribución, conocida que se restringe al lado occidental de la cordillera andina en Colombia, al sudoeste de Sibaté en el departamento de Cundinamarca (Mathias, 1936).

Clave para las Especies Trifolioladas de *Hydrocotyle* en Sudamérica

1a. Plantas glabras, hojas de menos de 1 cm de diámetro, umbelas con menos de 5 flores, pedicelos de 1–2 mm de largo . . . . . *H. minutifolia*

1b. Plantas pubescentes, hojas de más de 1.1 cm de diámetro, umbelas con más de 10 flores, pedicelos de más de 3 mm de largo.

2a. Umbelas con 10 a 15 flores, pedicelos pubescentes, foliolos 3-lobados, con el margen inciso-lobulado y mucronado. . . . . *H. apolobambensis*

2b. Umbelas 30 a 40 flores, pedicelos glabros, folíolos lanceolado-cuneados, con el margen inciso-dentado. . . . . *H. palmata*

Paratipos. BOLIVIA. **Dpto. La Paz:** Prov. Franz Tamayo, Área Natural de Manejo Integrado Apolobamba, Keara Viejo, al lado del Río que baja del Sur, 14°42′55″S, 69°04′58″W, 3360 m, 2 jun. 2005, *A. Fuentes & E. Cuevas 8602* (LPB, MO); Senda Pelechuco-Moxos, sector Tambo Quemado, 15 minutos hacia abajo del campamento siguiendo la senda, 14°41′17″S, 68°58′35″W, 3464 m, 12 may. 2003, *N. Paniagua, A. Araujo, H. Cabrera, R. Alvarez, A. Alvarez y L. Mamani 5748* (LPB). PERU. **Dpto. Cusco:** Prov. La Convención, Distrito Huaycopata, sector San Luis, 13°04′22″S, 72°22′54″W, 2995–3504 m, 24 nov. 2006, *L. Valenzuela, J. Farfan & E. Suclli 8106* (MO).

Nota. En etapa de impresión del presente artículo, durante una visita de M. Mendoza al Missouri Botanical Garden (MO) en junio del 2010, revisando material de proyectos en ejecución de Perú, identifica la colecta de *L. Valenzuela 8106* como *Hydrocotyle apolobambensis*, este nuevo registro extiende su distribución a Bolivia y Perú, confirmado así lo estimado por los autores al señalar: "pero dada su cercanía y la similitud de formaciones tanto geológicas como de ecosistemas con el Perú, es posible que la especie se encuentre también en este país."

Agradecimientos. Al personal del proyecto Madidi del Herbario Nacional de Bolivia (LPB) y del Missouri Botanical Garden (MO) en Bolivia, quienes colectaron por primera vez especímenes de esta especie. A Michael Nee (NY) que proporcionó información del material tipo de *Hydrocotyle minutifolia* y por sus acertadas recomendaciones en la revisión del presente artículo. La ayuda y sugerencias de John Wood (FHO, K) y de Peter Jørgensen (MO), y a Don Carlos Maldonado por la elaboración de la ilustración.

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A New Species of *Plantago* (Plantaginaceae) from Iran

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ABSTRACT. A new species, *Plantago orzuiensis* Mohsenz., Nazeri & Mirtadz. (Plantaginaceae), belonging to *Plantago* L. subg. *Albicans* Rahn, is described from Kerman Province in southeastern Iran. Its relationships to the closely related species *P. ciliata* Desf., *P. amplexicaulis* Cav., *P. lagocephala* Bunge, and *P. psammophila* Agnew & Chal.-Kabi are discussed. The most prominent features of the new species are the amplexicaul leaves; bracts that are to 6 mm long, boat-shaped, with a pilose midrib and ciliate margins; and hirsute corolla lobes to 2.5 mm long.

Key words: Iran, IUCN Red List, Kerman Province, Plantaginaceae, *Plantago*.

During investigation of the genus *Plantago* L. (Plantaginaceae) in Iran from fresh material as well as from dry specimens at the Kerman University Herbarium, one new species was found. The new species is characterized by its cylindrical spikes and by its sepals and boat-shaped bracts, both of which are pilose on the midrib and ciliate at the margins.

Plantago orzuiensis Mohsenz., Nazeri & Mirtadz., sp. nov. TYPE: Iran. Kerman Prov.: Orzuia, 1300 m, 10 May 2002, *M. Mirtadzadini 1221* (holotype, Kerman University Herbarium). Figure 1.

Haec species *Plantagini amplexicauli* Cav., *P. ciliatae* Desf., *P. lagocephalae* Bunge et *P. psammophilae* Agnew & Chal.-Kabi subarcte affinis, sed a his tribus habitu caulescente, foliis amplexicaulibus atque bracteis fertilibus longioribus, ab illis tribus spica cylindrica, ab omnibus bracteis fertilibus cymbiformibus distinguitur.

Plants annual, ca. 27 cm tall; sterile stems unbranched, pubescent; internodes 1.8–2.5 cm; fertile stems ca. 10 cm. Leaves 8–10 × 0.5–1 cm, lanceolate, amplexicaul, pubescent, margins entire, nerves 7; petioles 5.5–7 cm. Spikes cylindrical, 3.5–7 cm; peduncle 12–17 cm (Fig. 1); fertile bracts boat-shaped, 5–6 × 2.8–3 mm, exceeding the sepals, acute, bract margins membranous and ciliate, keeled and pilose on midrib (Fig. 2A). Flowers with sepals ovate, 3.5–4 mm, asymmetric, pilose along midrib, ciliate at apex, margin membranous, anterior sepals with narrower midrib, 0.5–0.75 mm, only ciliate at apex, posterior sepals with broader midrib, 1–1.5 mm, ciliate at apex as well as one lateral side (Fig. 2B); corolla tube glabrous, 2–2.5 mm, corolla lobes ovate, acuminate, hirsute, 2–2.5 × 1–1.2 mm (Fig. 2C); anthers winged at apex, the wing acuminate, russet, 1.1–1.25 mm (Fig. 2D). Seeds 2, 2.5–2.7 mm, brown with mucilaginous coating (Fig. 2E). Chromosome number: $2n = 30$ (Fig. 2F).

Distribution and habitat. *Plantago orzuiensis* was found at only one locality in Orzuia, in southern Kerman Province, Iran. Dozens of individuals were found at the type locality in dry sandy soils to 1300 m above sea level. This area is part of the Irano-Turanian phytogeographic region (Takhtajan, 1986), which is characterized by mean temperatures of 47°C (in the hottest month) and −10°C (in the coldest month) and a mean annual precipitation of 160 mm.

IUCN Red List category. *Plantago orzuiensis* has not yet been evaluated using IUCN Red List criteria (IUCN, 2001), although it is abundant at the collection site and produces many seeds. For now, its conservation status is estimated as Data Deficient (DD).

Cytology. Metaphasic chromosomes were obtained from root tips from seeds taken from the holotype collection. This revealed a somatic chromosome number of $2n = 30$, which is consistent with a previous count from *Plantago albicans* L., a member of subgenus *Albicans* Rahn, with a basic chromosome number of $x = 5$ (Badr & Elkholy, 1978).

Taxonomic notes. *Plantago orzuiensis* can be distinguished from closely related taxa by various characters. For example, *P. amplexicaulis* Cav. possesses conical spikes (vs. cylindrical ones in *P. orzuiensis*); the fertile bracts are ovate, glabrous, and not ciliate (vs. cymbiform, ciliate, with a pilose keel); the sepals are not ciliate (vs. ciliate); and the corolla lobes are glabrous (vs. hirsute). *Plantago ciliata* Desf. is a stemless plant (vs. stemmed in *P. orzuiensis*), with leaves not amplexicaul (vs. amplexicaul); the spikes are conical (vs. cylindrical); the fertile bracts are ovate and only 3–4 mm long (vs. cymbiform, and longer to

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Figure 1. *Plantago orzuiensis* Mohsenz., Nazeri & Mirtadz. Holotype specimen, *Mirtadzadini 1221* (Kerman University Herbarium).

6 mm); and the corolla lobes are 1.5–2 mm long (vs. 2–2.5 mm). *Plantago lagocephala* Bunge is also a stemless plant (vs. stemmed) that lacks amplexicaul leaves and has conical spikes; its fertile bracts are ovate, not ciliate, and only 3 mm long (vs. cymbiform, ciliate, with a pilose keel, to 6 mm); the sepals lack marginal cilia (vs. ciliate); and the corolla lobes are smaller, only to 1 mm (vs. 2–2.5 mm). *Plantago psammophila* Agnew & Chal.-Kabi is also stemless (vs. stemmed) (Patzak & Rechinger, 1965; Kazmi, 1974) with leaves not

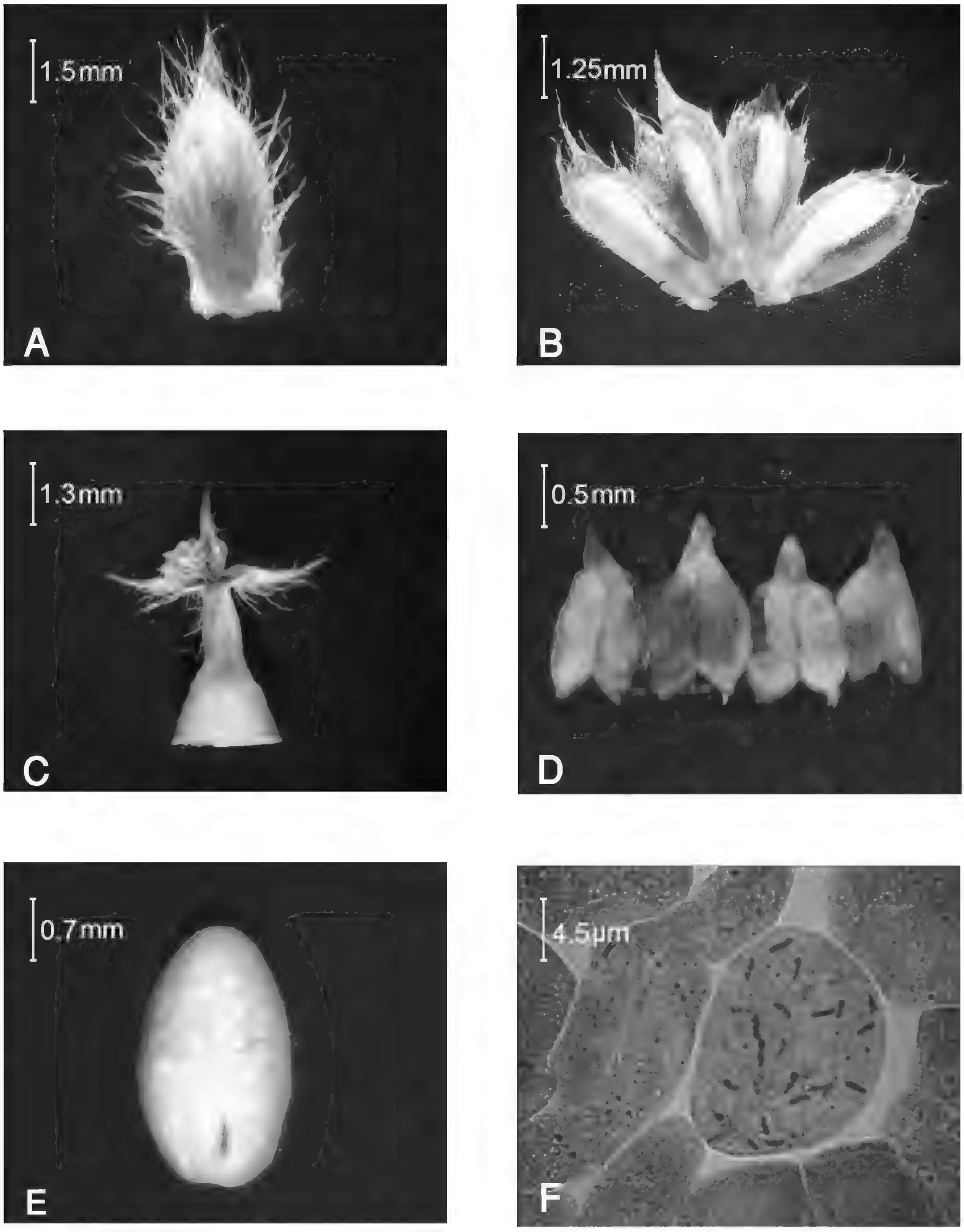

Figure 2. *Plantago orzuiensis* Mohsenz., Nazeri & Mirtadz. A–E. Structures obtained from the holotype, *Mirtadzadini 1221* (Kerman University Herbarium). —A. Bract. —B. Sepals. —C. Corolla. —D. Anthers. —E. Seed. —F. Metaphase chromosomes ($2n = 30$) obtained from roots of seeds from the holotype *Mirtadzadini 1221* (Kerman University Herbarium).

amplexicaul (vs. amplexicaul); the bracts are ovate, not ciliate, and only 4–5 mm long (vs. cymbiform, ciliate, with a pilose keel); and the corolla lobes are longer, ca. 3 mm long (vs. 2–2.5 mm).

Plantago orzuiensis is assigned to subgenus *Albicans* based on the lanceolate and villous leaves, the pubescent corolla limbs, the seeds with a longitudinal groove on the ventral side, the two

seeded pods, and the diploid chromosome number of $2n = 30$.

Paratype. IRAN. **Kerman:** Orzuia, 1300 m, 25 Apr. 2007, *Saeed Mohsenzadeh 6294* (Herbarium Institute Agronomic Keredjensis).

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Pleopeltis coenosora (Polypodiaceae), a New Species from Peru

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Abstract. *Pleopeltis coenosora* R. C. Moran (Polypodiaceae) is described as new from Peru. It is atypical in the genus by having coenosori. It most resembles *P. fraseri* (Mett. ex Kuhn) A. R. Sm. because of its strongly bicolorous rhizome scales, dark brown petioles, pinnatisect laminae, and obscure veins, but differs by the fewer and wider pinnae, the wider apical segment, the more strongly dimorphic sterile and fertile leaves, and the presence of coenosori. Furthermore, the juvenile leaves of the two species differ. Those of *P. coenosora* remain entire until up to 12 cm long, thereafter becoming pinnatisect; those of *P. fraseri* become pinnatifid when only about 5 cm long.

Resumen. Se describe a *Pleopeltis coenosora* R. C. Moran (Polypodiaceae) como nueva de Perú. Es atípica en el género por tener coenosoros. Se parece mucho a *P. fraseri* (Mett. ex Kuhn) A. R. Sm. a causa de sus escamas del rizoma fuertemente bicoloras, pecíolos pardo-oscuros, laminas pinnatisectas y venas obscuras, pero difiere por pinnas menos y más anchas, segmento apical más ancho, hojas estériles y fértiles más fuertemente dimorfas y la presencia de coenosoros. Además, las hojas juveniles de los dos especies difieren. Las de *P. coenosora* permanezcan enteras hasta 12 cm de longitud, después se tornan pinnatisectas; las de *P. fraseri* llegan a ser pinnatisectas cuando alrededor de 5 cm de longitud.

Key words: Ferns, IUCN Red List, Pasco, Peru, *Pleopeltis*, Polypodiaceae.

Pleopeltis Willd. contains about 45 species and is one of the principal Neotropical fern genera in the Polypodiaceae (Otto et al., 2009). Nearly all of its species occur in wet forests, and many are frequently encountered by collectors. While identifying recently collected ferns at MO, I came across the following new species. It is so distinct that I do not hesitate to describe it as new, even though it is known from only a single collection from Peru.

Pleopeltis coenosora R. C. Moran, sp. nov. TYPE: Peru. Pasco: Prov. Oxapampa, Distr. Huancabamba, Prosoya Jardín de Plantas Medicinales, 10°23′58″S, 75°29′12″W, 2200 m, 31 Oct. 2006, *R. Rojas et al. 3986* (holotype, HOXA; isotypes, MO, USM not seen). Figures 1, 2.

A *Pleopelte fraseri* (Mett. ex Kuhn) A. R. Sm. foliis sterilibus et fertilibus valdius dimorphis, lamina sterili 8–10 cm lata, pinnis fertilibus obtusis 4–6 mm latis inter se 3–4 cm distantibus et praesentia coenosororum differt.

Rhizomes ca. 1.5 cm wide, compact; rhizome scales 2–3 mm, lanceolate, sharply bicolorous with a dark central stripe and lighter borders; sterile and fertile leaves strongly dimorphic, the fertile longer-petiolate with narrower pinnae; sterile juvenile leaves entire for lengths up to 12 cm, thereafter becoming pinnatisect; sterile mature leaves with petioles up to 8.5 cm, dark brown, scaly throughout but especially toward the base, the scales 1.5–3 × 0.4–0.8 mm, lanceolate, mostly appressed, bicolorous with a dark central stripe and wide pale borders, ciliate to fimbriate; sterile laminae ca. 15 × 8–10 cm, the base abruptly decurrent, forming a short, narrow green wing on the adaxial surface of the petiole, moderately scaly abaxially, the scales up to 1.5 mm, lanceolate, appressed, pale brown with whitish fimbriate borders, the lamina apex somewhat resembling the lateral pinnae (not pinnatifid and tapered to the tip); sterile pinnae 1.5–2 cm wide, 3 or 4 pairs, entire, obtuse; rachis and costae dark brown like the petiole, scaly, the scales 1–3 mm, lanceolate, mostly appressed, bicolorous but less sharply so than those scales on the petiole; veins obscure, anastomosing; petioles of fertile leaves up to 18 cm, otherwise like the petioles of the sterile leaves; hydathodes present, the one on the basal acroscopic side of the pinnae enlarged, darkened, and sunken; fertile pinnae 4–6 mm wide, linear, obtuse, the basal ones 4–5 cm, 3–4 cm distant from the suprabasal pinnae; sori fused into a continuous long coenosorus, except for 1 to 3 distinct sori at the pinna base; paraphyses absent; spores yellow, monolete.

Relationships. *Pleopeltis coenosora* resembles *P. fraseri* (Mett. ex Kuhn) A. R. Sm. by its strongly bicolorous rhizome scales, dark brown petioles, pinnatisect laminae, and obscure veins. It differs from *P. fraseri* by its strongly dimorphic sterile and fertile leaves with the fertile pinnae noticeably

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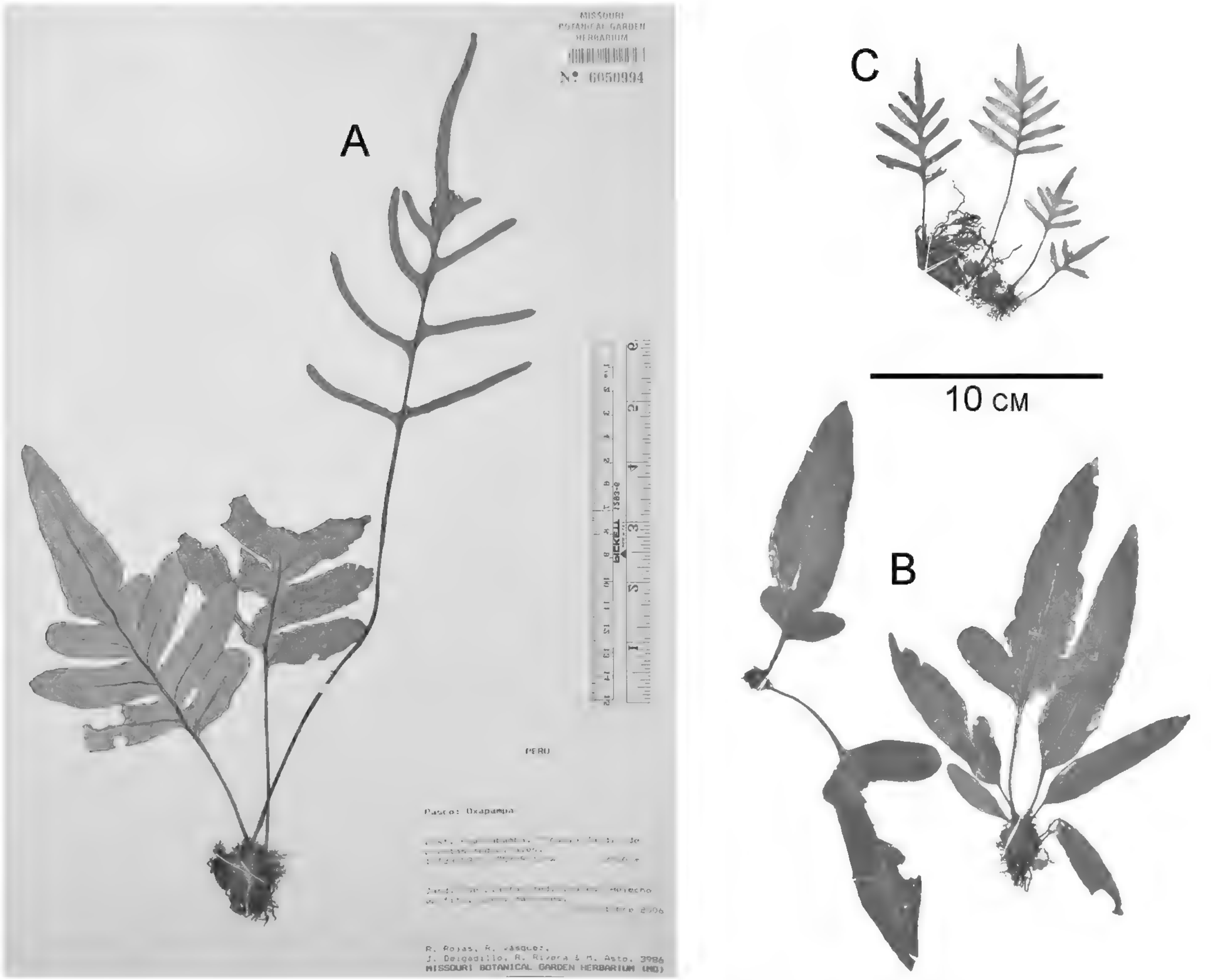

Figure 1. —A. Isotype of *Pleopeltis coenosora* R. C. Moran (*Rojas et al. 3986*, MO). B, C. Comparison of juvenile leaves. —B. *Pleopeltis coenosora* R. C. Moran (*Rojas et al. 3986*, HOXA). —C. *Pleopeltis fraseri* (Mett. ex Kuhn) A. R. Sm. (Ecuador, *Jaramillo 1001*, NY).

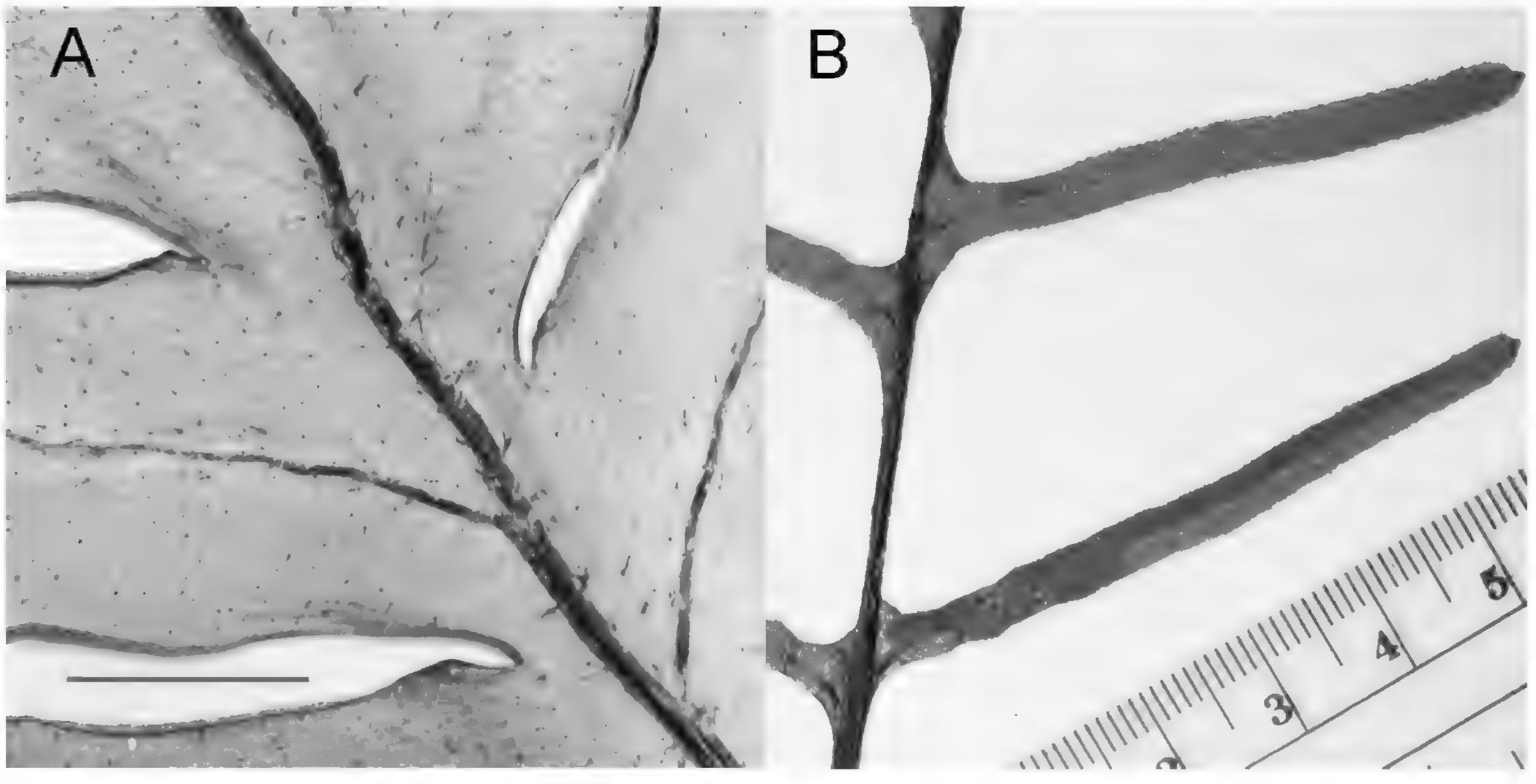

Figure 2. *Pleopeltis coenosora* R. C. Moran (*Rojas et al. 3986*, MO). —A. Abaxial surface of the lamina; note scattered scales and, in upper left, faint anastomosing veins (bar = 1 cm). —B. Detail of coenosorus; note one or two distinct sori at pinna bases.

narrower and spaced more distantly along the rachis (Figs. 1, 2). Sterile and fertile leaf dimorphy is also found in *P. fraseri*, but usually to a far lesser degree. *Pleopeltis coenosora* further differs by having wider sterile laminae and pinnae (1.5–2 mm vs. 2–4 mm), fewer pinna pairs (three or four vs. five to 20), and a broader apical segment that is mostly entire, not pinnatifid toward the tip as in *P. fraseri*. The juvenile leaves of the two species also differ. Those of *P. coenosora* are entire even when they are as long as 12 cm, whereas the juvenile leaves of *P. fraseri* become pinnatifid when only about 5 cm long (Fig. 1B, C).

Etymology. The specific epithet of the new species refers to the coenosori, which is yet another striking difference by which it differs from *Pleopeltis fraseri*, a species that has round, discrete sori (one or two discrete sori may be found at the base of the coenosorus in *P. coenosora*; Fig. 2B). Among the species of *Pleopeltis*, coenosori are rare. They are currently known only in *P. wiesbaurii* (Sodiro) Lellinger (Wagner, 1986) and two other species that belong to the genus (Otto et al., 2009), but for which combinations have not yet been made: *Neurodium lanceolatum* (L.) Fée and *Dicranoglossum panamense* (C. Chr.) L. D. Gómez.

IUCN Red List category. Because *Pleopeltis coenosora* is known from a single collection, it is assessed here as Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001).

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Bredemeyera hebeclada, a New Combination in Polygalaceae

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Abstract. The identity of *Securidaca hebeclada* DC. (Polygalaceae) is explained and a new combination is made: *Bredemeyera hebeclada* (DC.) J. F. B. Pastore. *Bredemeyera velutina* A. W. Benn. is synonymized under the latter name and its lectotype is selected herein. An illustration of *B. hebeclada* is provided, and its distribution and morphology are discussed.

Resumo. A identidade de *Securidaca hebeclada* DC. (Polygalaceae) é explicada e é proposto aqui uma nova combinação *Bredemeyera hebeclada* (DC.) J. F. B. Pastore. Além disso, *B. velutina* A. W. Benn. é sinonimizada sob o nome mais antigo *B. hebeclada* e com escolha de um lectótipo. Também é apresentada uma ilustração e comentários sobre a sua distribuição e morfologia.

Key words: Brazil, *Bredemeyera*, Polygalaceae, *Securidaca*.

During the preparation of Flora do Morro do Chapéu, Bahia (Pastore, unpublished), *Securidaca hebeclada* DC. was shown to be an older name for *Bredemeyera velutina* A. W. Benn. The name and type specimen of *S. hebeclada* were overlooked by early authors. Marques (1980, 1996) monographed the genera *Bredemeyera* Willd. and *Securicada* L. Unfortunately, she was not able to analyze the type of *S. hebeclada*, and the original description (de Candolle, 1824) does not describe the fruits (Marques, 1996). Consequently, the taxonomic identity of *S. hebeclada* has remained uncertain until now.

Securidaca and *Bredemeyera* are distinguished by their fruits, by their samara and capsule, respectively. Because the type collection of *S. hebeclada* has flowers but not fruits, this obviously contributed to the confusion that led de Candolle (1824) to include this species in *Securidaca*. *Bredemeyera* and *Securidaca* can be distinguished in flower through examination of the ovary revealing the early stage of fruit, which is 1-locular in *Securidaca* and 2-locular in *Bredemeyera* (Pastore & Cavalcanti, 2006). Because the type of *S. hebeclada* is in fact a *Bredemeyera*, a new combination is needed and is made below.

Bredemeyera hebeclada (DC.) J. F. B. Pastore belongs to a complex that involves four species: *B. kunthiana* (A. St.-Hil. & Moq.) Klotzsch ex A. W. Benn., *B. laurifolia* (A. St.-Hil. & Moq.) Klotzsch ex A. W. Benn., *B. velutina* A. W. Benn., and *B. autranii* Chodat. Marques (1980) treated these as discrete species, using leaf shape, size, and indument; floral dimensions; and the presence or absence of a ring of trichomes at the ovary base to separate them. However, with the large number of collections now available, it is difficult to find morphological discontinuities that justify the recognition of all four species, and it is possible that all four names refer to the same species. Until more solid conclusions can be drawn, it is proposed in this paper to treat only *B. velutina* in the synonymy of *B. hebeclada*, the name with the oldest specific epithet available in this complex.

Bredemeyera hebeclada (DC.) J. F. B. Pastore, comb. nov. Basionym: *Securidaca hebeclada* DC., Prodr. 1: 341. 1824. TYPE: "In Brasilia," s.d., *Anonymous s.n.* (holotype, G-DC; isotype, FI). Figure 1.

Bredemeyera velutina A. W. Benn., Fl. Bras. 13(3): 53. 1874, syn. nov. TYPE: Brazil. Minas Gerais: s. loc., 1842, *G. Gardner 4418* (lectotype, designated here, K; isotypes, CGE, F, NY, P).

Liana or scandent shrub, 2–5 m; stems velvety-pubescent near inflorescence. Leaves alternate; petiole 4–6 mm, pubescent; blade coriaceous, discolorous, (2–)3–10 × (1–)2–4 cm, elliptic to ovate-elliptic, apex acute, attenuate, obtuse to rounded, mucronate, margin ciliate, base acute, obtuse, or rounded, abaxial surface velvety-pubescent, adaxial surface shiny, scattered-pubescent on surface with midvein pubescent (Bahia) or pubescent to velvety-pubescent (Minas Gerais, Goiás, and Distrito Federal). Panicles (4–)8–20 cm; bracts 1.4–1.7 × 0.8–1.1 mm, persistent in fruit; bracteoles 0.9–1.4 × 0.6–1.1 mm; pedicels 0.3–0.8 mm. Flowers yellowish white becoming orange or dark reddish when dry, 4.4–6 mm; external abaxial sepal 1.9–2.4 × 1.4–2.1 mm; adaxial sepal 1.8–2.6 × 1.7–2.3 mm; internal sepal

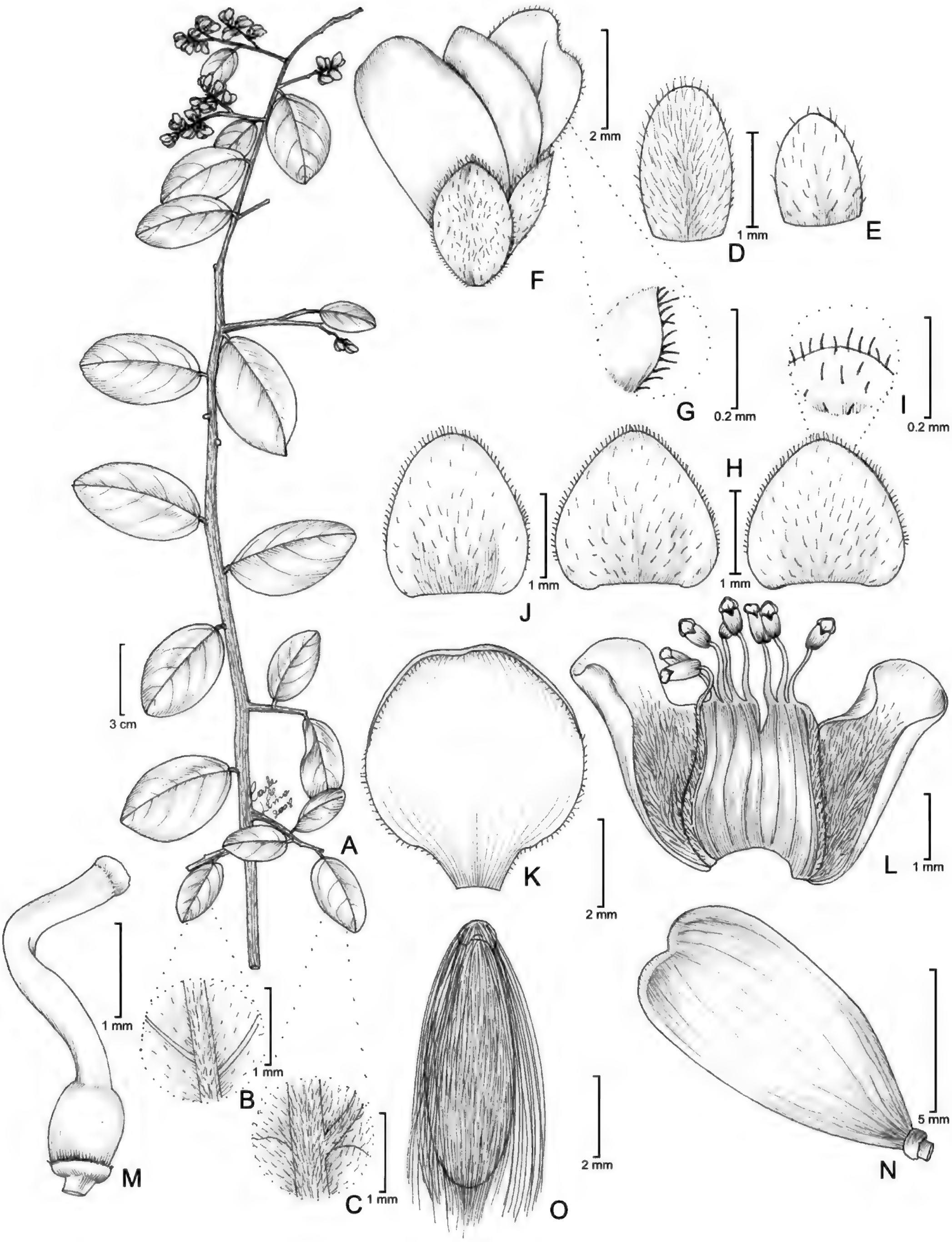

Figure 1. *Bredemeyera hebeclada* (DC.) J. F. B. Pastore. —A. Habit. —B. Leaf blade, adaxial face. —C. Leaf blade, abaxial face. —D. Bract. —E. Bracteole. —F. Flower. —G. Detail of internal sepal (wing). —H. Superior outer sepals. —I. Detail of external sepal margin. —J. Inferior outer sepal. —K. Internal sepal (wing). —L. Androecium and lateral petals. —M. Gynoecium with trichome disc around ovary base. —N. Capsule. —O. Seed. A from the holotype (G-DC), B–O from *E. Saar et al. 5027* (HUEFS).

(wing) orbicular to obovate, 4–5.3 × 3.2–6.3 mm, ciliate; carina 3.8–4.7 mm, 2.2–2.7 mm deep, inner surface puberulent, claw 1–1.3 mm; lateral petal slightly or not widened at apex, puberulent in medial ventral portion, 1.4–1.6 mm wide; rudimentary petal 0.7–0.8 × ca. 0.3 mm; filament sheath 4–5 mm, the free filaments 1.3–2 mm; style strongly curved; ovary with a ring of trichomes at base. Capsule flattened, oblanceolate, dark reddish, 12–17 × 4–6 mm, glabrous; seeds narrowly cylindrical, 6–8 × 1.8–2.7 mm, pubescent for most of length with soft spreading trichomes, at apex with a tuft of long trichomes longer than body of seed; aril apical, white, curved, puberulent.

Distribution and habitat. This species occurs throughout the Brazilian states of Bahia, Minas Gerais, and Goiás and in the Distrito Federal (Marques, 1980; Pastore & Cavalcanti, 2006); it is frequently collected in savanna regions and forest borders.

The specimen at K was chosen as lectotype because it is representative and the best-preserved specimen among the syntypes of *Bredemeyera velutina*. Furthermore, the Kew herbarium has kept an important part of the examined material and notes from Alfred W. Bennett, who prepared the Polygalaceae treatment for *Flora Brasiliensis* (Bennett, 1874).

Selected specimens examined. BRAZIL. s. loc., *J. B. E. Pohl 3049* (F not seen, F photo at F, NY, US not seen, US photo at US, W not seen). **Bahia:** Abaíra, caminho de Catolés–Capão, 6 July 1992, *W. Ganev 433* (HUEFS); Mucugê, Faz. Pedra Grande, 13°00′20″S, 41°33′48″W, 17 Feb. 1997 (fl.), *E. Saar et al. 5833* (HUEFS); Paulo Afonso, Est. Ecol. do Raso da Catarina, 09°33′08″S, 38°30′47″W, 31 Jan. 2006, *M. M. M. Lopes et al. 439* (HUEFS); Piatã, estr. Catolés–Inúbia, 7 July 2008, *W. Ganev 803* (HUEFS); Rio de Contas, 13°27′33″S, 41°52′24″W, 4 Feb. 1997, *E. Saar et al. 5027* (HUEFS). **Distrito Federal:** ca. 30 km S of Brasília, on rd. to Belo Horizonte, 26 Aug. 1964, *H. S. Irwin & T. R. Soderstrom 5611* (NY, RB, UB). **Goiás:** Cavalcante, trilha para a Ponte de Pedra, 20 Apr. 2003, *J. F. B. Pastore & E. Suganuma 514* (CEN, RB). **Minas Gerais:** Viçosa, campus da Univ. Fed. de Viçosa, 12 July 2002, *M. M. M. Lopes et al. 118* (HUEFS).

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A Synopsis, New Combinations, and Synonyms in *Acanthocladus* (Polygalaceae)

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Abstract. A synopsis of the American genus *Acanthocladus* Klotzsch ex Hassk. (Polygalaceae), based primarily on herbarium studies, is presented, along with an identification key to the currently accepted eight species. Two new synonyms and the following new combinations are presented: *A. dukei* (Barringer) J. F. B. Pastore & D. B. O. S. Cardoso, *A. pulcherrimus* (Kuhlm.) J. F. B. Pastore & D. B. O. S. Cardoso, and *A. santosii* (Wurdack) J. F. B. Pastore & D. B. O. S. Cardoso. The names *A. brasiliensis* Klotzsch ex Hassk. and *A. pulcherrimus* are lectotypified.

Resumo. A partir do estudo das coleções de herbário, uma sinopse de *Acanthocladus* Klotzsch ex Hassk. (Polygalaceae) é apresentada, incluindo chave de identificação para as oito espécies aceitas. Foram feitas também duas novas sinonimizações e as seguintes novas combinações: *A. dukei* (Barringer) J. F. B. Pastore & D. B. O. S. Cardoso, *A. pulcherrimus* (Kuhlm.) J. F. B. Pastore & D. B. O. S. Cardoso e *A. santosii* (Wurdack) J. F. B. Pastore & D. B. O. S. Cardoso. Além disso, os nomes *A. brasiliensis* Klotzsch ex Hassk. e *A. pulcherrimus* foram lectotipificados.

Key words: *Acanthocladus*, Central America, *Polygala*, Polygalaceae, South America.

Acanthocladus Klotzsch ex Hassk. (Polygalaceae) comprises eight species, occurring from seasonally dry to moist forests in South and Central America. The first species of the genus, *A. brasiliensis* Klotzsch ex Hassk., was originally described (Saint-Hilaire & Moquin-Tandon, 1828) within the African genus *Mundia* Kunth. Klotzsch noted that *M. brasiliensis* A. St.-Hil. & Moq. could represent a new genus and wrote the name *Acanthocladus* on herbarium sheets, but never published it. Subsequently, Hasskarl (1863–1864) validly published this genus, and Bennett (1874) accepted it and recognized an additional species. Nevertheless, succeeding taxonomic works treated *Acanthocladus* either as a section (Chodat, 1891–1893; Marques, 1984) or subgenus (Paiva, 1998) within the larger genus *Polygala* L. Recent phylogenetic studies based on molecular data (Persson, 2001; Forest et al., 2007) have shown the broad polyphyly of *Polygala* and strongly support the generic circumscription of *Acanthocladus*.

The species of *Acanthocladus* may be recognized by the combination of the following characters: habit shrubby to arborescent, with usually sharply thorny branches; leaves mostly coriaceous to subcoriaceous; flowers papilionaceous and usually congested in brachyblasts, sometimes fasciculate or rarely in racemes with a conspicuous rachis as in *A. santosii* (Wurdack) J. F. B. Pastore & D. B. O. S. Cardoso; sepals caducous in fruit; and capsules woody and dehiscent. Although most of these characters can be said to be plesiomorphic (Persson, 2001), together they are useful in distinguishing *Acanthocladus* from the remaining genera of Polygalaceae.

During our ongoing revision of the *Polygala* species of Bahia State, Brazil, we found it worthwhile to improve the taxonomy of *Acanthocladus*, making use of the results of recent molecular phylogenetic studies. These works supporting the recognition of *Acanthocladus* make it necessary to validate new combinations for species in the genus. Eriksen et al. (2000), in their treatment of Polygalaceae in Ecuador, provided only one new combination and described one new species of *Acanthocladus*. Having reevaluated the circumscription of *Acanthocladus*, we present here a synopsis of the genus, including an identification key to all currently accepted species, new synonyms, and taxonomic transfers for the remaining species.

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I. Acanthocladus Klotzsch ex Hassk., Ann. Mus. Bot. Lugduno-Batavum 1: 184. 1864. *Polygala* L. sect. *Acanthocladus* (Klotzsch ex Hassk.) Chodat, Mém. Soc. Phys. Genève 31(2): 6. 1893. *Polygala* L. subg. *Acanthocladus* (Klotzsch ex Hassk.) Paiva, Fontqueria 50: 146. 1998. TYPE: *Acanthocladus brasiliensis* Klotzsch ex Hassk.

Shrub to tall tree (25 m or taller); branches usually ending in sharp thorns. Leaves subopposite or alternate, mostly coriaceous to subcoriaceous (membranous in *A. brasiliensis* and *A. guayaquilensis* B. Eriksen & B. Ståhl). Inflorescence usually an axillary, congested brachyblast, sometimes appearing fasciculate or rarely a raceme with a conspicuous rachis. Flowers papilionaceous, pedicellate; sepals caducous in fruit, free; petals usually whitish purple; carina with apex not crested; stamens 8, the filaments partly joined into a sheath and adnate to lower part of carina; gynoecium curved. Capsule oblate, compressed, dehiscent, pericarp woody; seeds usually 2, puberulent to pubescent, ovoid, with a conspicuous white, carnose aril.

Etymology. The name *Acanthocladus* is from the Greek for "acantha" (spine or thorn) and "clados" (branch), due to the branches ending in thorns, as commonly found in most species.

Identification Key for *Acanthocladus* Species in Central and South America

1a. Flowers not in congested racemes, the fertile axis conspicuous, 10–25 mm long . . . . . 7. *A. santosii*
1b. Flowers in very congested racemes, resembling fasciculate umbels, the fertile axis absent to 1 mm long.
  2a. Leaves opposite to subopposite.
    3a. Tree to 25 m high; leaves ovate; rudimentary petals 2.5–3 mm long, spatulate; Amazon moist forest . . . . . 8. *A. scleroxylon*
    3b. Shrub, treelet, or tree to 15 m high; leaves ovate-elliptic; rudimentary petals 0.5–1.5 mm long, oblong to narrowly oblong; seasonally dry forest.
      4a. Tree to 15 m high; terminal thorns slender to obsolete when mature; leaves rigidly coriaceous, papillate on abaxial surface; pedicels 4–5 mm long; Colombia . . . . . 3. *A. colombianus*
      4b. Shrub, treelet, or small tree to 5 m high; terminal thorns stout; leaves subcoriaceous or membranous, not papillate on abaxial surface; pedicels more than 5 mm long.
        5a. Leaves subcoriaceous to coriaceous; racemes 3- to 8-flowered; pedicels 10–15 mm long, glabrous; enlarged lateral sepals elliptic; lateral petals 4–7 mm long, oblanceolate . . . . . 1. *A. albicans*
        5b. Leaves membranous; racemes 2- to 4-flowered; pedicels 5–6 mm long, puberulent; enlarged lateral sepals broadly oblong to almost circular; lateral petals 1.5–2 mm long, narrowly oblong . . . . . 5. *A. guayaquilensis*
  2b. Leaves distinctly alternate.
    6a. Shrub 0.8–1.5 m high; leaves 2.2–5 × 1–2.7 cm, papyraceous; flowers 5.5–6.4 mm long . . . . 2. *A. brasiliensis*
    6b. Tree 3–14 m high; leaves more than 8.5 × 3.5 cm, coriaceous; flowers 10–15 mm long (but unknown in *A. dukei*).
      7a. Leaves 8.5–11.5 × 3.5–6.2 cm, 1.8–2.4× as long as wide, mostly ovate to broadly lanceolate; peduncle of fruits ca. 0.5 cm long; Panama . . . . . 4. *A. dukei*
      7b. Leaves (10–)13–25 × (3–)4–8 cm, 2.1–3.9× as long as wide, lanceolate to elliptic; peduncle of fruits 1–2.1 cm long; Brazilian Atlantic Forest . . . . . 6. *A. pulcherrimus*

1. Acanthocladus albicans A. W. Benn., in Eichler & Urban, Fl. Bras. 13(3): 46. 1874. *Polygala bicolor* Vell., Fl. Flumin. Icon. 7: 59. 1831, non *Polygala bicolor* Kunth, in HBK, Nov. Gen. Sp. (quarto ed.) 5: 394, tab. 507. 1823, nom. illeg. *Polygala bennettii* Chodat, Mém. Soc. Phys. Genève 30(8): 113. 1889, nom. superfl. *Polygala albicans* (A. W. Benn.) Grondona, Darwiniana 8(2–3): 291. 1948. TYPE: Vellozo 7: tab. 59. 1827 (lectotype, designated by Marques [1984: 7]). Figure 1.

Polygala albicans (A. W. Benn.) Grondona var. *caracaensis* Glaz. ex Marques, Rodriguésia 36(60): 7. 1984, as *caraçaensis*, syn. nov. TYPE: Brazil. Minas Gerais: "Entre Inficionado et Caraça," 1885 (fl.), *Glaziou 14493* (holotype, B not seen; isotypes, G not seen, G photo at G, K, P).

Polygala albicans (A. W. Benn.) Grondona var. *silvae* Marques, Rodriguésia 36(60): 7. 1984, syn. nov. TYPE: Brazil. Goiás: Rio Araguaia, Rio Coco, margem esquerda, 15 Aug. 1978 (fl.), *N. T. Silva 4830* (holotype, MG; isotype, RB).

Distribution and habitat. *Acanthocladus albicans* is the most widespread species of the genus. It occurs mainly in dry forest and shrubby caatinga of northeastern Brazil, ranging southward in semideciduous forests in the states of Minas Gerais and Rio de Janeiro, southeastern Brazil, and in some enclaves of dry forest in the state of Goiás and the central Brazilian plateau (extending to the dry forest within the boundaries of the Chaco dominium in southeastern Bolivia and northeastern Argentina and Paraguay) (Fig. 1).

Discussion. Marques (1984) separated *Acanthocladus albicans* into three varieties. We find that her

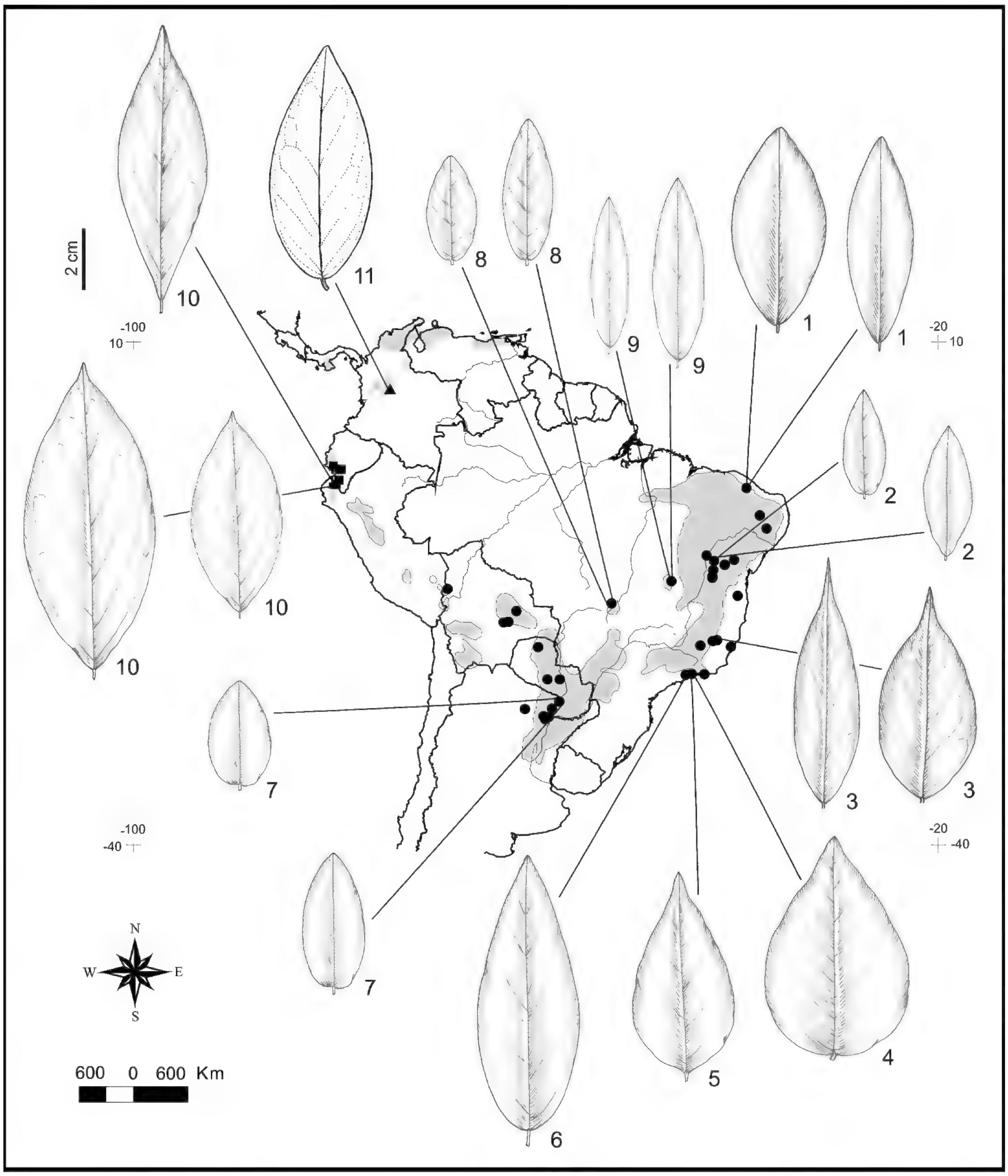

Figure 1. Geographical distribution map for the *Acanthocladus albicans* complex with variation of leaf morphology throughout their range within the Neotropical seasonally dry tropical forest (SDTF) dominium (light gray): *A. albicans* (●), *A. colombianus* (▲), and *A. guayaquilensis* (■). The leaf outlines are from: 1. *T. S. Guedes 486*; 2. *F. B. Ramalho 103*; 3. *K. B. Strier 1232*; 4. *L. C. Giordano et al. 1404*; 5. *M. G. Bovini et al. 479*; 6. *M. C. Marques 198*; 7. *E. Zardini & P. Aquino 34730*; 8. *N. T. Silva 4830* (type, *Polygala albicans* var. *silvae*); 9. *M. L. Fonseca 2973* (*A. albicans*); 10. *X. Cornejo & C. Bonifaz 6028* (type, *A. guayaquilensis*); 11. *B. Maguire & C. K. Maguire 44019* (type, *A. colombianus*).

characters for distinguishing the varieties overlap. In addition, these varieties can occur sympatrically across the species range. Taking into account its widespread geographical distribution in South America, *A. albicans* seems to constitute a single species displaying great variation in its leaf morphology (Fig. 1). Therefore, we do not accept here the varieties proposed by Marques (1984). *Acanthocladus albicans* closely resembles *A. colombianus* Aymard & J. F. B. Pastore and *A. guayaquilensis* in leaf morphology and petal size, but can be distinguished by the combination of leaves subcoriaceous to coriaceous (vs. hardly

coriaceous in *A. colombianus* and membranous in *A. guayaquilensis*) and not papillate on the abaxial surface (vs. papillate in *A. colombianus*), pedicels 10–15 mm long (vs. 4–5 mm long in *A. colombianus* and 5–6 mm long in *A. guayaquilensis*), enlarged lateral sepals elliptic (vs. oblong in *A. colombianus* and broadly oblong to almost circular in *A. guayaquilensis*), and oblanceolate, 4–7 mm long lateral petals (vs. oblong, 3–4 mm long in *A. colombianus* and narrowly oblong, 1.5–2 mm long in *A. guayaquilensis*).

Although *Polygala bicolor* Vell. is the oldest name for *Acanthocladus albicans*, it is a later homonym of *P. bicolor* Kunth. Following Article 53.1 of the *International Code of Botanical Nomenclature* (ICBN; McNeill et al., 2006), the name *P. bicolor* Vell. is illegitimate and, therefore, its epithet does not have priority when used in combination with the genus *Acanthocladus* (Art. 45.3). Because *A. albicans* was published as a substitute for *P. bicolor*, it must be based on the same type collection (Art. 7.3). *Polygala bennettii* Chodat (1889) was published as a replacement name for *A. albicans*, although the epithet *albicans* was available in *Polygala* and should have been adopted (Grondona, 1948), rendering the name *P. bennettii* nomenclaturally superfluous under Article 52.1. Marques (1984) designated the plate (Vellozo, 1827: tab. 59) as the lectotype of *P. bicolor* Vell., and thus also the type of *A. albicans* and *P. bennettii*. Nevertheless, Bernardi (2000) did not follow this previous lectotypification and considered *Glaziou 5820* as the type for *P. albicans*.

Additional specimens examined. (An asterisk [*] indicates specimens mapped in Fig. 1.) ARGENTINA. **Chaco:** *P. Jørgensen 2091* (GH). **Corrientes:** San Cosme, *A. Krapovickas 13013* (MO); Itatí, bank of Río Paraná, *T. M. Pedersen 7080* (NY), *T. Ibarrola 908* (NY); Corrientes, *T. Meyer 5893* (GH), *L. R. Parodi 11939* (GH); Río Paraná, Puerto González, *T. Ibarrola 758* (NY). **Formosa:** *A. Krapovickas & C. L. Cristóbal 13072* (MO). BOLIVIA. **La Paz:** Franz Tamayo, Parque Nac. Madidi, *V. M. Torres et al. 208* (MO). **Santa Cruz:** A. Ibáñez, Cotoca, Camino a Paurito, *G. Coimbra S. 694* (NY); 7 km SE of Comun. Don Lorenzo, *M. Nee 40190* (NY). BRAZIL. **Bahia:** Ibipeba, Faz. São Vicente, **F. B. Ramalho 103* (RB); Itaju do Colônia a Feirinha, *T. N. Santos 404* (CEPEC); Utinga, *J. E. M. Brazão 3* (RB). **Ceará:** Serra do Bezouro, **T. N. Guedes 486* (NY, RB). **Espírito Santo:** Santa Teresa, Várzea Alegre, *V. Demuner et al. 938* (RB). **Goiás:** Rio Araguaia, Margem do Rio Coco, *N. T. Silva 4830* (NY, RB); São Domingos, Gruta de Terra Ronca, **M. L. Fonseca 2973* (CEN, IBGE, RB). **Minas Gerais:** Caratinga, Est. Ecol. de Caratinga, **K. B. Strier 1232, 1335* (NY); Serra da Caraça, *Glaziou 14493* (B, P). **Paraíba:** Maturéia, *M. F. Agra et al. 4416* (MO). **Pernambuco:** Floresta, Reserva Biol. de Serra Negra, *M. J. N. Rodal 683* (RB). **Rio de Janeiro:** Maricá, Ponta do Fundão, *M. C. L. Ramos 1357* (RB); Parati, Parati-Mirim, Ilha da Cotia, APA Cairuçu, **L. C. Giordano et al. 1404* (RB), **M. G. Bovini et al. 479* (RB); Parati, Praia de Jabaquara, **M. C. Marques 198* (RB); Praia Grande, Morro do Cavalão, *Glaziou 5820* (K, MPU, P, US). PARAGUAY. **Alto Paraguay:** *L. Molas & V. Vera 1101* (MO). [**Amambay:**] N. Paraguay, entre Río Apa y Río Aquidaban, *K. Fiebrig 4771, 5134* (GH). **Central:** Estero de Yapá, Puerto Guyrati, Villa Oliva, **E. Zardini & A. Aquino 34730* (RB); Concepción, *E. Hassler 7293* (GH, NY). **Presidente Hayes:** *E. Zardini & L. Guerrero 40510* (MO).

2. Acanthocladus brasiliensis Klotzsch ex Hassk., Ann. Mus. Bot. Lugduno-Batavum 1: 184. 1864. *Mundia brasiliensis* A. St.-Hil. & Moq., Ann. Soc. Sci. Orléans 9: 56. 1828. *Polygala klotzschii* Chodat, Mém. Soc. Phys. Genève 30(8): 114. 1889, non *Polygala brasiliensis* L., Mant. Pl. 1: 99. 1767. TYPE: Brazil. São Paulo: prov. de Saint-Paul, 1816 (fl.), *A. Saint Hilaire C1 1061* (lectotype, designated here, P).

Distribution and habitat. *Acanthocladus brasiliensis* is markedly characterized by the shrubby habit with very thorny branches, leaves small, alternate, and papyraceous, and the inflorescences 1- to 3(4)-flowered. It is found in the Brazilian states of Rio de Janeiro, São Paulo, Paraná, and Mato Grosso do Sul, in areas of savannas and of disturbed forests (Marques, 1984).

Discussion. Chodat (1889) in a broad delimitation of *Polygala*, which included two *Acanthocladus* species, could not use the epithet *brasiliensis* to make a new combination in the genus *Polygala* because of the precedence of *P. brasiliensis* L. We chose *A. Saint Hilaire C1 1061* (P #00647133) as lectotype because it is undoubtedly part of the original materials used by Saint-Hilaire and Moquin-Tandon (1828) and consists of a representative and well-preserved specimen that matches with the original description and illustration of the species.

Additional specimens examined. BRAZIL. **Mato Grosso do Sul:** Amambaí, *Dobereiner & Tokarnia 895* (RB). **Paraná:** *G. Hatschbach et al. 8767* (MBM, MO). **São Paulo:** prov. de Saint-Paul, *A. Saint Hilaire C2 1261* (P), *A. Saint Hilaire s.n.* (P); Bragança Paulista, *R. Mello-Silva et al. 372* (NY, RB, SPF); Campinas, Santa Elisa, *H. F. Leitão F. & N. Taroda 2613* (NY); Ibiúna, bairro Sorocabuçu, ca. 8 km da SP-250 NO Km 63, *T. Yano & O. Yano 49* (RB, SP); Iperó, Faz. Ipanema, *R. R. Rodrigues et al. 94* (RB); Jaguariúna, *J. Mattos 9084* (RB, SP); Jundiaí, 25 Sep. 1949, *F. C. Hoehne s.n.* (NY, RB, SP); Limeira, próx. a Limeira, 25 Sep. 1951, *F. C. Hoehne s.n.* (NY, RB, SPF); Monte Alegre-Amparo, *M. Kuhlmann 917* (RB, SP); Pilar do Sul, 5 km N da cidade, *J. Mattos 9215* (RB, SP); Santa Bárbara do Oeste, E edge of city, on E side of hwy. just S of railroad, *G. Eiten et al. 5712* (RB, SP); São Paulo, Jardim Botânico de São Paulo, *L. Rodrigues 68* (GH, RB, SP); Sarapuí, Rod. Raposo Tavares, Km 157, Faz. Aterradinho, 10 Sep. 1989, *E. S. Petty s.n.* (ESA, RB); Serra do Japí, ca. 10 km SW of Jundiaí, *H. F. Leitão F. et al. 3180* (NY); Sorocaba, próx. a Brigadeiro Tobias, *A. S. Grotta s.n.* (RB); Teodoro Sampaio, Morro do Diabo, *S. Romaniuc-Neto et al. 1214* (RB, SP); Valinhos,

Serra dos Cocais, *R. G. Udulutsch et al. 24* (HUEFS); Vinhedo, Estação de tratamento de água, 23 Sep. 1977, *H. Makino s.n.* (RB, SP).

3. Acanthocladus colombianus Aymard & J. F. B. Pastore, Caldasia 31(1): 14. 2009. TYPE: Colombia. [Cundinamarca:] 16 km below Fusagasugá, semixeric tableland, 1200 m, 19 Aug. 1959 (fl., fr.), *B. Maguire & C. K. Maguire 44019* (holotype, NY). Figure 1.

Distribution and habitat. This species is only known from the type collection gathered in an area of seasonally dry forest of the inter-Andean valley of Cundinamarca Department, Colombia (Fig. 1), thus representing the first record of the genus from the Andes (Aymard & Pastore, 2009).

Discussion. *Acanthocladus colombianus* is very closely related to *A. albicans* and *A. guayaquilensis*, but it can be distinguished from both by an arborescent habit ca. 15 m high, smaller to obsolete terminal thorns, leaves that are rigidly coriaceous and papillate on the abaxial surface, and flowers with shorter pedicels (4–5 mm long vs. more than 5 mm long).

4. Acanthocladus dukei (Barringer) J. F. B. Pastore & D. B. O. S. Cardoso, comb. nov. Basionym: *Polygala dukei* Barringer, Ann. Missouri Bot. Gard. 70: 203. 1983. TYPE: Panama. Darién: the Bolimina, s.d. (fr.), *J. A. Duke & N. Brista 385* (holotype, US not seen, US photo at US).

Distribution and habitat. *Acanthocladus dukei* is only known by the type collection and is the single species of the genus found in Central America, where it occurs in the tropical evergreen forest of Darién Province.

Discussion. *Acanthocladus dukei* closely resembles *A. pulcherrimus* (Kuhlm.) J. F. B. Pastore & D. B. O. S. Cardoso based mainly on its alternate leaves, as well as on the arborescent habit, with the branches not ending in thorns, and a similar fruit size and shape. Although the flowers of *A. dukei* are still unknown, this species can be recognized by its fruits with a very short, ca. 0.5-cm-long peduncle (vs. the peduncles 1–2.1 cm long in *A. pulcherrimus*) and leaves that are usually smaller, 8.5–11.5 × 3.5–6.2 cm, and ovate to broadly lanceolate (vs. leaves 13–23 × 4–8 cm, lanceolate to elliptic in *A. pulcherrimus*).

5. Acanthocladus guayaquilensis B. Eriksen & B. Ståhl, Fl. Ecuador 65: 7. 2000. TYPE: Ecuador. Loja: Bosque Petrificado Puyango, Quebrada El Chirimoyo, 03°53′S, 80°04′W, 17 Feb. 1998 (fl.), *X. Cornejo & C. Bonifaz 6028* (holotype, GUAY not seen; isotypes, GB not seen, MO, NY). Figure 1.

Discussion. This species can be diagnosed by the combination of membranous leaves and few-flowered racemes, these flowers borne on short (5–6 mm long), puberulent pedicels, with enlarged lateral sepals broadly oblong to almost circular and the lateral petals narrowly oblong, 1.5–2 mm long. *Acanthocladus guayaquilensis* is part of a species complex that includes *A. albicans* and *A. colombianus*. Although these species share several morphological characters, their geographic range does not overlap. *Acanthocladus guayaquilensis* is endemic to the dry forests of Pacific coastal Ecuador. The geographic distribution of this species complex on disjunct areas of dry vegetation is in accordance with the distribution pattern of several Neotropical plant species or groups of closely related species that have been used to define the Neotropical seasonally dry tropical forest (SDTF) dominium (Pennington et al., 2000; Prado, 2000) as shown in Figure 1.

Additional specimens examined. ECUADOR. **El Oro/Loja:** Bosque petrificado Puyango, Quebrada El Inca, *X. Cornejo & Cornejo 4088* (GB, GUAY, K, MO); Quebrada El Chirimoyo, *X. Cornejo & Cornejo 4103* (GB, GUAY, K, MO). **Guayas:** Reserva Ecol. Manglares Churute, quebrada del Cerro Cimalón, *X. Cornejo & C. Bonifaz 5124* (GB, GUAY, MO); Cordillera del Naranjo, hills NW of Salanguillo, *Valverde 1703* (MO).

6. Acanthocladus pulcherrimus (Kuhlm.) J. F. B. Pastore & D. B. O. S. Cardoso, comb. nov. Basionym: *Polygala pulcherrima* Kuhlm., Arq. Inst. Biol. Veg. 2(1): 83. 1935. TYPE: Brazil. Espírito Santo: Vale do Rio Doce, Lagoa Juparana, 30 Mar. 1934 (fl.), *J. G. Kuhlmann 101* (lectotype, designated here, RB 1685).

Discussion. Although Kuhlmann (1935) properly typified this species, it is worthwhile to discuss its complex history. First, Bentham (1837) published *Corytholobium macrophyllum* Benth. within Fabaceae, changing later (1867) its family placement to Polygalaceae (Bernardi, 2000). Then, Bennett (1874) published *Securidaca corytholobium* Benth. ex A. W. Bennett as a new name for *C. macrophyllum* in the Polygalaceae, providing an illustration based on a confusion of two different species and genera, and citing three different specimens, *Blanchet 2087*, *Burchell 9733*, and *Poeppig 2826*. According to Article 7.3 of the ICBN (McNeill et al., 2006), *S. corytholobium* must have the same type as *C. macrophyllum*, i.e., *Poeppig 2826*. Furthermore, the

other species in Bennett's illustration, representing the collection *Blanchet 2087*, was later described as *Polygala pulcherrima* by Kuhlmann (1935), who chose different type collections (*Kuhlmann 101* and *Velho s.n.*), possibly to avoid even more confusion. We chose *Kuhlmann 101* as lectotype because it is better preserved and also the first collection cited in the protologue.

Acanthocladus pulcherrimus together with *A. dukei* and *A. santosii* are the only species of the genus that do not have thorny branches. *Acanthocladus pulcherrimus* is distinguished by the combination of its remarkably large leaves, sometimes reaching 25 cm long (vs. 8.5–11.5 cm long in *A. dukei*), and its congested racemes, resembling fasciculate umbels (vs. flowers in racemes with a well-developed axis in *A. santosii*). It occurs in the Atlantic rainforest and matas de tabuleiro of the states of Bahia, Espírito Santo, Minas Gerais, and Rio de Janeiro.

Additional specimens examined. BRAZIL. **Bahia:** Ad Ripas, *Blanchet 2087* (BR, K); Ilhéus, area do CEPEC, Km 22, rod. Ilhéus–Itabuna, *J. L. Hage & T. S. Santos 1766* (CEPEC, HUEFS, RB); Una, Faz. São Rafael, *R. S. Pinheiro 313* (CVRD, NY); Taboquinhas, *T. S. Santos 1773* (NY). **Espírito Santo:** Boa Esperança, *L. Kollmann et al. 10204* (MBML); Ibiraçu, prox. da estrada 101, Linhares, Reserva Nat. da CVRD, *D. A. Folli 4679* (CVRD); Linhares, Bananal, *P. P. P. Velho s.n.* (R not seen, RB 19063); Linhares, Km 10 da rod. a Bananal lado N, *T. S. Santos 2017* (CEPEC, RB); Pedro Canário, Faz. São Joaquim, *G. Martinelli et al. 11847* (NY, RB); Santa Leopoldina, Santa Lúcia, *L. Kollmann et al. 4060* (MBML, RB). **Minas Gerais:** Itueta, *E. Tameirão-Neto 2464* (HUEFS). **Rio de Janeiro:** São João da Barra, Guaxindiba, Faz. São Pedro, *H. C. Lima et al. 5222* (RB).

7. Acanthocladus santosii (Wurdack) J. F. B. Pastore & D. B. O. S. Cardoso, comb. nov. Basionym: *Polygala santosii* Wurdack, Bradea 3: 17. 1979. TYPE: Brazil. Bahia: Km 36 da Rod. BR 101, de Texeira de Freitas à Itamarajú, 16 Aug. 1972 (fl.), *T. S. Santos 2392* (holotype, CEPEC; isotypes, RB, US not seen, US photo at US). Figure 2.

Distribution and habitat. *Acanthocladus santosii* is putatively endemic in southern Bahia and northern Espírito Santo, an important region of the Atlantic forest known for its endemic taxa and deserving special attention for its conservation (Thomas et al., 1998).

Discussion. Wurdack (1979) in his original description of *Polygala santosii* noted its morphological resemblance to *P. pulcherrima* [= *Acanthocladus pulcherrimus* (Kuhlm.) J. F. B. Pastore & D. B. O. S. Cardoso], but did not assign *P. santosii* to any section of *Polygala*. In the most recent revision of the Brazilian *Acanthocladus* species by Marques (1984), as well as in Bernardi's (2000) account of *Polygala*, *A. santosii* was overlooked or perhaps deliberately excluded from *Polygala* sect. *Acanthocladus* due to its noticeably different inflorescence, which is an elongate raceme. We here suggest that racemes in *A. santosii* do not significantly differ from the inflorescences found in the remaining species of the genus, except for a more conspicuous elongation of the fertile internodes and axis. The other characters that lead us to place *P. santosii* within *Acanthocladus* without hesitation include the caducous sepals in fruit and the morphology of the flower, fruit, and seed. *Acanthocladus santosii* is herein illustrated for the first time (Fig. 2).

Additional specimens examined. BRAZIL. **Bahia:** Itagimirim, Faz. Benfica, *M. M. Santos & J. C. A. Lima 137* (HRB, RB); Porto Seguro, Parque Nac. de Monte Pascoal, *W. W. Thomas 11232* (HUEFS, NY), *11351* (CEPEC, HUEFS, NY). **Espírito Santo:** Linhares, Vale do Rio Doce, *T. S. Santos 947* (CEPEC, RB); Sooretama, Reserva Flor. de Sooretama, *D. Sucre 5437* (RB).

8. Acanthocladus scleroxylon (Ducke) B. Eriksen & B. Ståhl, Fl. Ecuador 65: 6. 2000. Basionym: *Polygala scleroxylon* Ducke, Trop. Woods 50: 35. 1937. TYPE: Brazil. Amazonas: Humaytá, betw. Rio Madeira & Lago Paraiso, 26 June 1936 (fl.), *A. Ducke s.n. [315]* (holotype, RB 29038; isotypes, F not seen, F photo at F, GH, K, MG, MO, NY, P, US not seen, US photo at US).

Discussion. *Acanthocladus scleroxylon* is the only species of the genus occurring across the Amazon Basin (Brazil, Ecuador, and Peru). It is morphologically close to *A. albicans*, but differs by the combination of puberulent pedicels and longer rudimentary petals, 2.5–3 mm long (vs. pedicels glabrous and rudimentary petals 0.5–1.5 mm in *A. albicans*), as well as the arboreal habit that can reach 25 m in height.

Additional specimens examined. PERU. **Loreto:** Quebrada Sucursari, *Gentry et al. 54305* (K, MO, NY). **Madre de Dios:** Manú, Río Manú, Cocha Cashu station, *W. R. Foster 9559, 9681* (MO, NY). **San Martín:** Alto Río Huallaga, Juan Jui, *Klug 3830, 4344* (K, NY).

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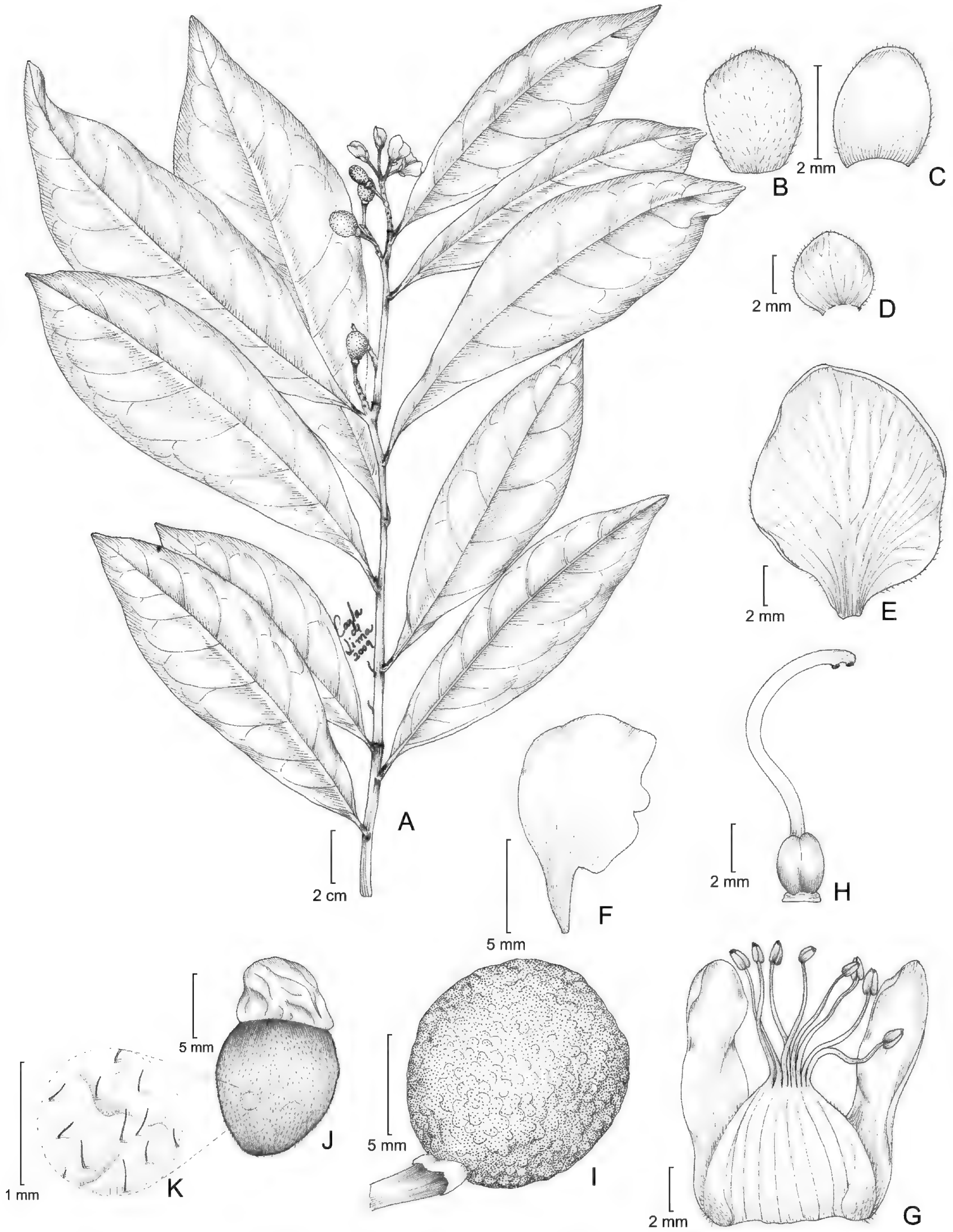

Figure 2. *Acanthocladus santosii* (Wurdack) J. F. B. Pastore & D. B. O. S. Cardoso. —A. Flowering branch. —B. Bract dorsal face. —C. Bract ventral face. —D. External inferior sepal. —E. Internal sepal (wing). —F. Carina. —G. Androecium and lateral petals. —H. Gynoecium. —I. Fruit. —J. Seed. —K. Detail of seed indumentum. Drawn by Carla de Lima from *W. W. Thomas et al. 11232* (HUEFS).

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Weberbauerocereus madidiensis (Cactaceae), una Nueva Especie del Norte de Bolivia

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Resumen. *Weberbauerocereus* Backeb. fue considerado un género endémico para el Perú. Se publica aquí el primer miembro de este género para Bolivia, *W. madidiensis* Quispe & A. Fuentes (Cactaceae), restringido a los bosques secos yungueños subandinos del Valle del Tuichi, en el área protegida Madidi, al norte de la población de Apolo (departamento La Paz, provincia Franz Tamayo). *Weberbauerocereus madidiensis* muestra similitudes con *W. churinensis* F. Ritter y *W. johnsonii* F. Ritter pero se diferencia por su escasa ramificación, ramas sin pseudocefalio, espinas usualmente entre 13 a 19 por aréola, flores cortas, estigma no emergente y fruto redondo.

Abstract. *Weberbauerocereus* Backeb. was considered a genus endemic to Peru. We publish here the first member of this genus from Bolivia, *W. madidiensis* Quispe & A. Fuentes (Cactaceae), restricted to dry forests in the Yungas subandean region of the Tuichi Valley north of the community of Apolo inside the Madidi protected area (La Paz Department, Franz Tamayo Province). *Weberbauerocereus madidiensis* is similar to *W. churinensis* F. Ritter and *W. johnsonii* F. Ritter, but differs by its reduced branching, the lack of a pseudocephalium, the spines usually 13 to 19 per areole, shorter flowers, a nonemergent stigma, and round fruits.

Key words: Bolivia, Cactaceae, IUCN Red List, Madidi National Park, tropical dry forest, *Weberbauerocereus*.

El género *Weberbauerocereus* Backeb., perteneciente a la tribu Trichocereeae (Cactaceae) y considerado hasta ahora como un género endémico para el Perú, fue descrito por Backeberg (1942) en honor al Dr. Augusto Weberbauer, botánico alemán que dedicó su vida al estudio de la vegetación de los Andes peruanos (Anderson, 2001). Se reconocen ocho especies. Arakaki et al. (2003) reconocen las especies *W. churinensis* F. Ritter, *W. cuzcoensis* Kníže, *W. longicomus* F. Ritter (incluyendo el sinónimo *W. albus* F. Ritter), *W. winterianus* F. Ritter (incluyendo el sinónimo *W. johnsonii* F. Ritter), *W. rauhii* Backeb., *W. torataensis* F. Ritter y *W. weberbaueri* (K. Schum. ex Vaupel) Backeb. Charles (2000) y Arakaki et al. (2003) sugieren que *Oreocereus tacnaensis* F. Ritter es posiblemente una especie de *Weberbauerocereus* o híbrido entre *Oreocereus* (A. Berger) Riccob. y *Weberbauerocereus*, pero la combinación no se ha hecho aun. Hunt et al. (2006) reconocen las primeras siete especies, más *W. cephalomacrostibas* (Werderm. & Backeb.) F. Ritter. Otros géneros que se sugiere están relacionados a *Weberbauerocereus* son *Rauhocereus* Backeb., *Haageocereus* Backeb. (Anderson, 2001) y *Cleistocactus* Lem. (Arakaki et al., 2003). *Weberbauerocereus* se caracteriza por ser arbóreo o arbustivo, flores tubulares ligera a fuertemente zigomorfas en forma de S, tubo floral y fruto cubiertos de pequeñas escamas y/o pelos lanosos y presencia de un pseudocefalio en algunas especies (Arakaki et al., 2003).

En el Perú, las especies de *Weberbauerocereus* están distribuidas desde las vertientes occidentales y valles interandinos del norte peruano hasta su extremo sur, entre los 500 y 3500 m, algunas especies cubren rangos geográficos extensos mientras que la mayoría presentan poblaciones restringidas a áreas reducidas (Arakaki et al., 2003), en bioclimas de tipo termotropical árido (T = 18.7°C–19.3°C; P = 15–17 mm) y mesotropical árido (T = 12.8°C–15.2°C; P = 227–441 mm) caracterizado por temperaturas y precipitaciones bajas (Galan et al., 2009).

En Bolivia, *Weberbauerocereus madidiensis* se ha encontrado en la cuenca del valle del río Tuichi, en los bosques secos yungueños subandinos dentro del Área Natural de Manejo Integrado Madidi, al norte de la población de Apolo en el departamento de La Paz.

En un bioclima xérico a semiárido (T = 19°C–24°C; P = ca. 760 mm), con un marcado efecto orográfico de sombra de lluvia (Navarro, 2002).

Weberbauerocereus madidiensis Quispe & A. Fuentes, sp. nov. TIPO: Bolivia. La Paz: Franz Tamayo, Área Natural de Manejo Integrado Madidi, carretera entre Apolo y San Marcos, 14°34′57″S, 68°26′42″W, 1200 m, 31 oct. 2006 (fl.), *A. Fuentes & N. Quispe 11285* (holotipo, LPB; isotipos, MO, USM). Figura 1.

Haec species *Weberbauerocereo churinensi* F. Ritter et *W. johnsonii* F. Ritter similis, sed a hoc ramis 16- ad 24-costatis pseudocephaliis carentibus, ab illo quaque areola spinis 11 ad 19 tantum armata atque fructu globoso seminibus atrobrunneis, ab ambobus floribus brevioribus 30–52.7 mm longis atque stigmate non emergente differt.

Cactus columnar, erecto, 5(–7) m de alto, 10–15 (–33) cm de diám., escasamente ramificado, a 1(–1.5) m de la altura del tronco, algunas ramas articuladas; ramas erectas sin pseudocefalio, 30–52.7 mm diám., epidermis verde oscura a verde clara; ramas jóvenes con espinas pardas y amarillentas en la parte apical, ligeramente brillosas, tallos maduros con espinas blanquecinas en la parte inferior; costillas 16 a 24, 1–2.4 × 4.5–7.9 mm, redondeadas; aréolas circulares a ligeramente ovaladas, 1.3–2.7 mm diám., separadas 3–4.5 mm una de la otra, con tomento amarillento en el ápice de las ramas jóvenes y grisáceo en las ramas adultas; espinas (11)13 a 19 por aréola, lisas, aciculares, en la parte superior de la aréola de 1–3 × ca. 0.2 mm, en la parte inferior de la aréola de 4–7.7 × ca. 0.2 mm. Flores situadas en el tercio superior y ápice de los tallos, nocturnas, infundibuliformes, ligeramente zigomorfas, 30–52.7 mm; receptáculo 9.8–15.4 × 11.9–12.3 mm, globoso, escotado en el borde superior en contacto con el tubo floral, verde, carnoso, cubierto de escamas triangulares, alargadas de 2–4.7 × 1–1.5 mm, convexas en la base, borde entero, ápice acuminado, con tomento denso, pelos axilares (2.1–)6–13.7 mm, pardos y rojizos con reflejos dorados; escamas del tubo 6.5–9.5 × 1.4–2 mm, pelos axilares menos densos; tépalos exteriores triangulares, 9–11.5 × 2–2.8 mm, verdosos a pardos y grisáceos, ápice agudo, pardo-amarillento; tépalos interiores oblongos, 9.2–11.1 × 2.4–3.2 mm, subcarnosos, blancos, suavemente rojizos hacia el ápice, ápice agudo a ligeramente obtuso; cámara nectarífera semicerrada, 7.4–13.4 mm de largo, 4.5–4.6 mm diám. en la base y 6.7–7.6 mm diám. en la parte superior, paredes cubiertas con la continuación de los filamentos de los estambres inferiores; estambres numerosos dispuestos en 2 hileras, blancos; estambres inferiores con filamentos de 16.4–19.1 mm; estambres superiores con filamentos en ciclo o línea bien definida, 7–8.8 mm; anteras lanceoladas, (2.5–)3.3–4.5 mm, blancas; pericarpelo globoso, asimétrico, cámara seminífera de 4.6–5.7 mm diám., con numerosos óvulos parietales; estilo 25.1–32.7 × 1.6–1.8 mm, blanco-verdoso; estigma no emergente, 4.7–5.7 mm, 15 lóbulos, verde claro. Fruto una baya que se abre a lo largo de la parte central cuando madura, ca. 28 mm diám., redonda, cubierta de escamas y pelos, verdoso-rojiza a parda, pulpa blanca, jugosa; semillas numerosas, reniformes, 1.4–1.6 × 1–1.2 mm, superficie lisa, pardo oscura y pardo-rojiza alrededor del hilo, sin cresta.

Distribución, hábitat y fenología. Conocida hasta la fecha de los bosques secos yungueños subandinos de la cuenca del río Tuichi en el departamento de La Paz, entre las poblaciones de San Marcos y Azariamas, al norte de Apolo, territorio incluido en el Área Natural de Manejo Integrado Madidi. Se desarrolla en las áreas más secas de esta formación, en el piso termotropical inferior, caracterizado por un bioclima xérico y ombroclimas entre seco a semiárido (Navarro, 2002), entre los 730 y 1200 m. Crece tanto en bosques sucesionales y secundarios así como en bosques primarios.

Weberbauerocereus madidiensis ha sido observado en el campo y colectado con flores en el mes de octubre. Frutos maduros fueron colectados en diciembre a partir de una planta cultivada en el vivero de cactáceas del Jardín Botánico La Paz del Instituto de Ecología de la Universidad Mayor de San Andrés.

Categoria de la Lista Roja de UICN. Considerada En Peligro (EN A3c), de acuerdo a los criterios de la UICN (2001). A pesar de encontrarse poblaciones en el Parque Nacional y Área Natural de Manejo Integrado Madidi, la mayor parte de su área de distribución recibe múltiples amenazas por la presencia de una carretera, recientes movimientos de colonización, incremento de áreas abiertas para cultivo y pastoreo, quema y extracción de leña. Recientemente, la proliferación de actividades mineras y de prospección petrolera ha hecho la especie aún más vulnerable.

Discusión. Weberbauerocereus madidiensis es similar a *W. churinensis* pero se diferencia de ésta por su menor número de espinas por aréola (usualmente entre 13 y 19 vs. 40 y 60), flores mas cortas (30–52.7 mm vs. 90–120 mm), con estigma no emergente sobre los estambres versus estigma emergente sobre los estambres, fruto redondo con semillas pardo oscuras lustrosas versus fruto oblongo con semillas negras lustrosas. Con *W. johnsonii* se diferencia por el menor número de costillas (entre 16 y 24 vs. 30 y 35),

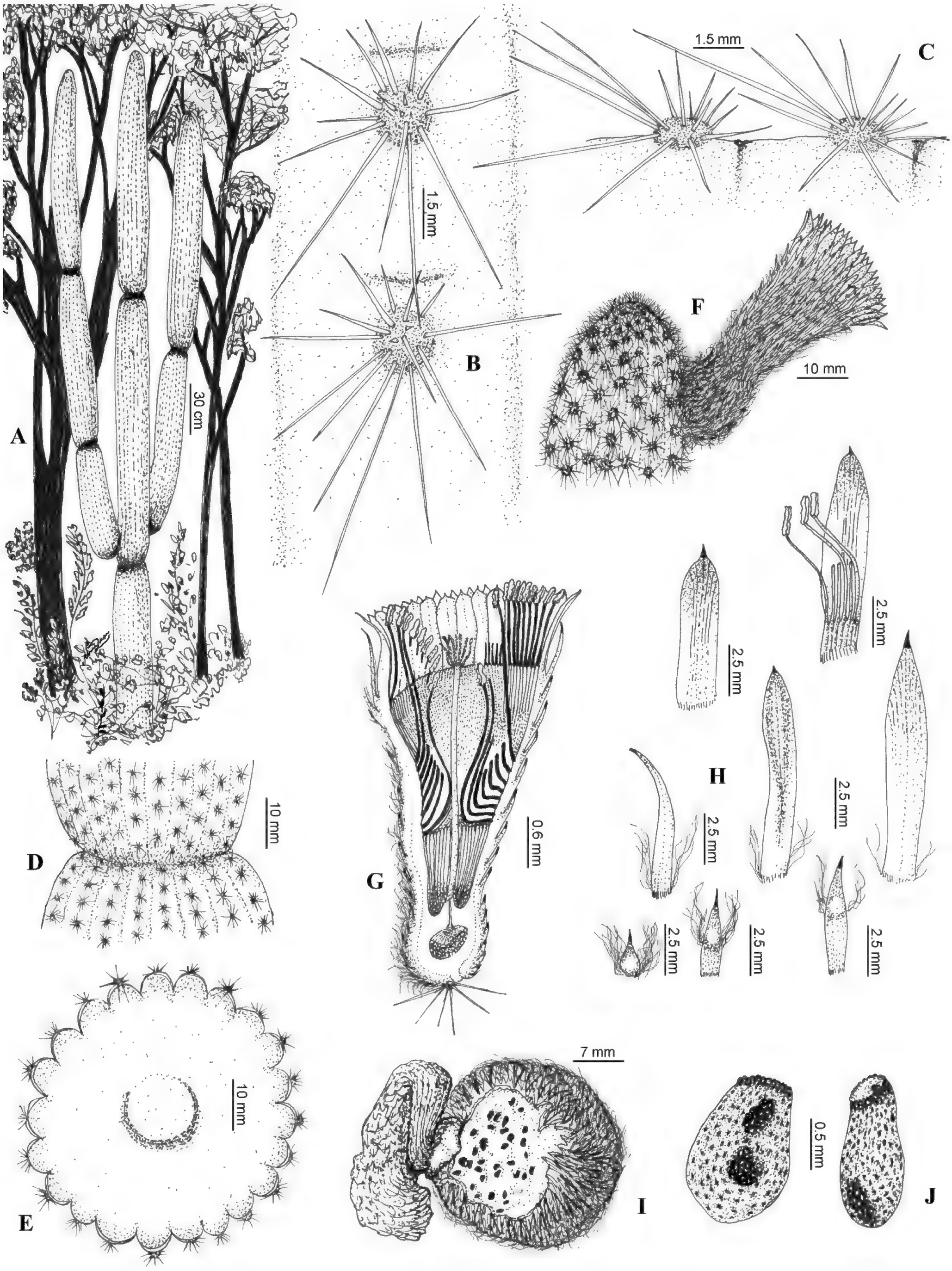

Figura 1. *Weberbauerocereus madidiensis* Quispe & A. Fuentes. —A. Habito. —B, C. Detalle de espinas. —D. Articulación de la rama. —E. Corte transversal de ramas. —F. Vista lateral del ápice de rama y flor. —G. Corte longitudinal de la flor. —H. Escamas y tépalos de la flor. —I. Fruto maduro. —J. Semillas. A–J dibujados de N. Quispe del tipo, *A. Fuentes & N. Quispe 11285* (LPB).

pseudocefalio ausente versus presente, flores más cortas (30–52.7 mm vs. 110 mm), con estigma no emergente sobre los estambres versus estigma emergente sobre los estambres.

Comparando con los géneros bolivianos existentes, *Weberbauerocereus* esta más asociado con *Yungasocereus* F. Ritter, se diferencian en las ramificaciones (muchas ramificaciones curvadas desde la base vs. pocas ramificaciones erectas desde la base), el numero de costillas (entre cinco a ocho no tuberculadas sin ranuras vs. seis a 10 tuberculadas con ranuras entre las aréolas), las aréolas y espinas (grandes, largas, tomentosas con espinas numerosas vs. pequeñas, redondas con cuatro a 12 espinas) y fruto (5 cm vs. 2.8 cm largo).

Paratipos. BOLIVIA. **Dpto. La Paz:** Prov. Franz Tamayo, Área Natural Madidi, Azariamas al N de Apolo, 14°20′43″S, 68°32′21″W, 6 jun. 2005 (est.), *A. Fernández, L. Cayola, J. Uzquiano, P. Sevillanos & G. Jove 120* (LPB); Área Natural Madidi, Unapa, 14°32′32″S, 68°29′42″W, 970 m, 2 sep. 2004 (est.) [cultivándose en el Jardín Botánico de La Paz, IE-UMSA], *L. Cayola, A. Antezana, F. Miranda, C. Cuevas & D. Cuevas 822* (LPB); Parque Nac. Madidi, camino de Apolo–Azariamas, Arroyo Pintata, 14°27′57″S, 68°32′9″W, 19 feb. 2003 (est.), *A. Araujo-M., H. Cabrera, M. Calzadilla, F. Canqui, L. Cayola, C. Maldonado, N. Paniagua, R. Alvarez, A. Alvarez & M. Alvarez 445* (LPB, MO); Parque Nac. Madidi, camino Apolo–Azariamas, Arroyo Pintata, 14°28′41″S, 68°32′13″W, 4 mar. 2003 (est.), *N. Paniagua, H. Cabrera, F. Canqui, M. Alvarez & A. Alvarez 5647* (LPB, MO).

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Two New Species of *Hedysarum* (Fabaceae) from Iran

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Abstract. *Hedysarum orumiehense* Ranjbar and *H. neyshaboricum* Ranjbar, two new species endemic to Iran, are described and illustrated. Both new species belong to section *Multicaulia* Boiss. in *Hedysarum* L. (Fabaceae) and are distinct among Iranian species. The former species is closely related to *H. atropatanum* Bunge ex Boiss. and is distinguished by its glabrous pods, the leaflets in eight to 11 pairs, and the longer corolla wings (10–11 mm). The latter is distinguished from *H. paucifoliolatum* Ranjbar & Olanj by its longer peduncles (20–27 cm), stipules (7–9 × 4–5 mm), and corolla standard (15–17 × 13–14 mm). Both *H. orumiehense* and *H. neyshaboricum* are evaluated as Vulnerable (VU) according to IUCN Red List criteria.

Key words: Fabaceae, *Hedysarum* sect. *Multicaulia*, Iran, IUCN Red List.

Hedysarum L., with ca. 200 species, is a large genus within the tribe Hedysareae (Fabaceae) and is distributed in temperate to boreal regions of the Northern Hemisphere (Vassiljeva, 1987). The main centers of diversity are in Middle Asia and North America, but the genus also occurs in Europe and the Mediterranean region (Yakovlev et al., 1996; Ranjbar et al., 2007a, b). Plants of the genus are perennial herbs, rarely semishrubs, and they occur in varied habitats including alpine and arctic meadows, stony grasslands, deserts, or seashores (Ranjbar et al., 2007a, b). The flora of Iran is relatively rich in *Hedysarum* species with 28 species, of which 16 are endemic (Rechinger, 1984; Ranjbar et al., 2004, 2006, 2007a, b), and new *Hedysarum* taxa have been described recently for Iran (Ranjbar et al., 2004, 2006). In October 2005, I made an expedition to the Silvaneh range near Orumieh, in western Iran, an area adjacent to eastern Turkey. During field collection, the specimen *Ranjbar 7092* was initially identified as *H. atropatanum* Bunge ex Boiss. However, its glabrous pod and many leaflets distinguish it from *H. atropatanum*, which has an appressed pubescent pod. As a result, the new species *H. orumiehense* Ranjbar (Fabaceae) is described here. A second new species, *H. neyshaboricum* Ranjbar, also described here, differs from *H. paucifoliolatum* Ranjbar & Olanj by having longer peduncles and flowers.

1. Hedysarum orumiehense Ranjbar, sp. nov. TYPE: Iran. Azarbaijan Garbi: Orumieh, Shahr-Chai dam, near Band, 1530 m, 11 June 2005 (fl., fr.), *M. Ranjbar 7092* (holotype, BASU; isotypes, FUMH, MO, TARI, W). Figure 1.

Haec species *Hedysaro atropatano* Bunge ex Boiss. affinis, sed ab eo foliolis 8- ad 11- (nec 4- ad 6-) jugatis, racemo 22- ad 33- (nec 10- ad 15-) floro, petalis longioribus vexillo 17–18 mm (nec 14–15 mm) alis 10–11 mm (nec 3–4 mm) atque legumine aculeis flavorubris dense obtecto differt.

Plants to 40 cm tall, with numerous wiry stems from a tough rootstock, appressed pubescent; stems branched only from near the base; caudex to 5 mm diam. Stipules 5–6 × 4–5 mm, light brown, slightly connate on the side opposite to the leaves, the lower ones triangular, the upper narrowly triangular and acuminate, adnate to the petiole for 1–1.5 mm, sparsely to loosely covered with appressed white trichomes (ca. 0.3 mm); leaves imparipinnate, 6.5–11.5 cm; petioles of lower leaves 10–11.5 cm, those of upper leaves often shorter, to 5 mm long, subdensely to loosely covered with appressed white trichomes; leaflets in 8 to 11 pairs, oblong to lanceolate or elliptic, rarely obovate, 8–18 × 3–9 mm, apex obtuse to rounded, mostly shortly mucronulate, densely appressed pubescent abaxially (trichomes ca. 0.5 mm), grayish, adaxially densely to sparsely appressed pubescent (trichomes 0.5–1 mm), green. Inflorescence a dense raceme of 22 to 33 flowers, oblong-ovate, elongating in fruit to 28 cm; peduncles 12.5–15.5 cm, 1–1.5 mm thick, erect to ascending, exceeding the leaves, densely to loosely appressed pubescent (trichomes ca. 0.5 mm); bracts 3–3.3 × ca. 1 mm, linear-lanceolate, membranous; pedicels 2–3 mm, appressed pubescent. Flowers erect to slightly spreading to nodding; bracteoles linear, shorter than the calyx tube, ca. 1.5 mm, loosely covered by short appressed trichomes; calyx 6–7 mm, tubular-campanulate, densely covered with short appressed white trichomes (ca. 0.3 mm); calyx teeth narrowly linear to subulate, 3–5 mm; corolla flushed with mauve, standard 17–18 mm, blade 9–10 mm wide, obovate, apex slightly emarginate, gradually attenuate to the base, wings lingulate,

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Figure 1. *Hedysarum orumiehense* Ranjbar. —A. Fertile habit. —B. Calyx. —C. Standard. —D. Keel. —E. Immature pod. —F. Wings. —G. Androecium. Drawn from the holotype *Ranjbar 7092* (BASU). Scale bar: A = 3 cm; B–G = 1.5 cm.

shorter than the standard, 10–11 mm, apex rounded to subobtuse; blades 6–7 × 2.5–3 mm; claw 2.5–3 mm, keel 18–19 mm, ± equaling the standard; blades subtriangular, 13–14 × 6–7 mm, obtuse at the apex; auricle indistinct, claw 4–5 mm, staminal tube obliquely cut; ovary linear, short white appressed pubescent; style glabrous. Legumes immature, 3- to 5-jointed, linear, straight, densely covered with

yellowish red prickles, but without appressed white trichomes or only densely pubescent at margin.

Distribution and habitat. *Hedysarum orumiehense* has a restricted distribution. It occurs on the eastern slope of the Silvaneh and Razhan mountains in West Azerbaijan Province, Iran. It was collected from a small population growing on dry steppe and stony clay along the roadside.

IUCN Red List category. *Hedysarum orumiehense* is known only from the type locality, where one small population consisting of no more than 20 plants was observed sparsely scattered near a small village. Therefore, this species is classified as Vulnerable (VU), a category that includes taxa with small populations that could be at risk, according to IUCN Red List criteria (IUCN, 2001).

Phenology. Flowering occurs in May and June; fruit ripening occurs from June to August.

Etymology. The new species is named after the type locality, the town of Orumieh, in West Azerbaijan Province, Iran.

Taxonomic relationships. Although I have not seen the type of *Hedysarum atropatanum* at W, the original description agrees in all respects with the material for *Ranjbar 6090* (BASU), which is from the type locality Seidkhodzi near Khoy (Boissier, 1872; Rechinger, 1984). In addition, *H. atropatanum* is the only other species of *Hedysarum* sect. *Multicaulia* Boiss. known from the Iranian province of West Azerbaijan. *Hedysarum orumiehense* was seen in the field by the author and is known from only five specimens from the type locality that are deposited at BASU.

The new species is closely related to *Hedysarum atropatanum* in the similar shape, size, and indumentum of the leaflets and in the stipules, which are connate on the side opposite to the leaves in both species. *Hedysarum orumiehense* differs from *H. atropatanum* by its larger corolla (17–18 mm vs. 14–15 mm) and wings (10–11 mm vs. 3–4 mm), the densely yellowish red aculeate vs. white aculeate legumes, the greater number of leaflets (eight to 11 vs. four to six), and the more densely flowered axillary racemes (22- to 33-flowered vs. 10- to 15-flowered).

2. Hedysarum neyshaboricum Ranjbar, sp. nov. TYPE: Iran. Khorasan: N of Neyshabor, around Abshar, Bar village, 1850–1900 m, 20 May 1996, *A. Rafeie & H. Zangooei 27013* (holotype, FUMH; isotype, BASU). Figure 2.

Haec species *Hedysaro paucifoliolato* Ranjbar & Olanj affinis, sed ab eo plantis 45–50 cm (nec usque ad 35 cm tantum) altis, stipulis 7–9 × 4–5 mm (nec 5–6 × 2–3 mm), foliis 11–14 cm (nec 3.5–6.5 cm) longis, foliolis 2- ad 4- (nec 1- vel 2-[vel 3-]) jugatis, pedunculo 20–27 cm (nec 7–10 cm) longo, racemo 22- ad 30- (nec 10- ad 15-) floro, petalis majoribus vexillo 15–17 × 13–14 mm (nec 10–11 × 7–8 mm) alis 7–8 mm (nec 4–5 mm) longis atque ovario glabro (nec trichomatibus albis appressis dense vestito) differt.

Plants to 50 cm tall, with numerous stems from a tough rootstock, appressed pubescent; stems 9–19 cm, branched from near the base; caudex to 1 cm, covered with stipule and petiole remnants. Stipules 7–9 × 4–5 mm, light brown to membranous, semiconnate, the lower ones triangular, the upper narrowly triangular and acuminate from a wide base, adnate to petiole for 2–3 mm, sparsely to loosely covered with appressed white trichomes (0.5–0.8 mm); leaves imparipinnate, 11–14 cm; petioles of lower leaves 2.9–4.5 cm, those of upper leaves often shorter, 0.8–2.5 cm, densely to loosely covered with appressed white trichomes; leaflets in 2 to 4 pairs, ovate-lanceolate, 20–55 × 10–34 mm, apex obtuse to round or rarely slightly retuse, mostly shortly mucronulate, loosely to sparsely appressed pubescent abaxially (0.4–1 mm), green to grayish green, adaxially loosely to sparsely appressed pubescent. Inflorescence a dense raceme of 22 to 30 flowers, oblong-ovate; peduncles 20–27 × 0.25–0.4 cm, erect to ascending, exceeding the leaves, densely to loosely appressed pubescent (trichomes 0.2–0.6 mm); bracts 5–6 mm, linear-lanceolate, membranous to papery, apex purplish; pedicels 2–3 mm, appressed pubescent, the upper flowers often sessile. Flowers erect to spreading; bracteoles shorter than the calyx tube, glabrous to sparsely covered by short appressed trichomes; calyx 6–7 mm, tubular-campanulate, densely covered by short appressed white trichomes (0.4–0.7 mm); calyx teeth narrowly linear to subulate, 3–5 mm; corolla dark purple, standard 15–17 mm, blade 13–14 mm wide, obcordate, apex deeply emarginate, gradually attenuate to the base, glabrous, wings lingulate, shorter than the standard and keel, 7–8 mm, apex rounded; blades 5–6 × ca. 3 mm; auricle shorter than claw, claw ca. 2 mm, keel 13–14 mm, exceeding the wings; keel blades subtriangular, 10–11 × 7–7.5 mm, apex subacute; auricle indistinct, claw ca. 4 mm; staminal tube obliquely cut; ovary with a stipe 0.5–1 mm, with 4 or 5 ovules, linear, glabrous; style glabrous. Legumes not seen.

Distribution and habitat. *Hedysarum neyshaboricum* is a narrowly distributed endemic known only from the dry zone of the mountainous region near Abshar, Bar village, north of Neyshabor in Khorasan Province, Iran, growing on limestone and stony clay substrates.

Figure 2. *Hedysarum neyshaboricum* Ranjbar. —A. Habit with details of flower and pod. —B. Calyx. —C. Standard. —D. Keel. —E. Wings. —F. Pistil. —G. Androecium. Drawn from the holotype *Rafeie & Zangooei 27013* (FUMH). Scale bar: A = 3 cm; B–G = 1.5 cm.

IUCN Red List category. The type locality of the new species is the unprotected Binalood mountainous region; therefore, *Hedysarum neyshaboricum* is assessed here as Vulnerable (VU) according to IUCN Red List criteria (IUCN, 2001). The conservation status cannot be more precisely determined because this species is known only from a single collection.

Phenology. *Hedysarum neyshaboricum* has been collected in flower from May to June.

Etymology. The species is named after the type locality, the town of Neyshabor, in Khorasan Province, Iran.

Taxonomic relationships. The similar shape and number of leaflets confirm a close relationship between *Hedysarum neyshaboricum* and *H. paucifoliolatum*. The two taxa are similar in their ovate to ovate-lanceolate leaflets and similarly sized bracts and calyces. However, the new species differs by having a glabrous ovary (vs. densely short-appressed, white indument), a longer peduncle (20–27 cm vs. 7–10 cm), more densely flowered inflorescences (22- to 30-flowered vs. 10- to 15-flowered), and a larger corolla standard (15–17 × 13–14 mm vs. 10–11 × 7–8 mm) with a longer wing (7–8 mm vs. 4–5 mm). Furthermore, plants range to 50 cm in *H. neyshaboricum* (vs. to 35 cm in *H. paucifoliolatum*) and leaf blades are longer (11–14 cm vs. 3.5–6.5 cm). Measurements for *H. paucifoliolatum* are taken from the holotype.

Acknowledgments. I appreciated help from Ernst Vitek, Bruno Wallnöfer, and Walter Till during my visit to W and WU in Vienna. I thank the Director of the Herbarium of the Research Institute of Forests and Rangelands (TARI); Herbarium of Ferdowsi University (FUMH), Mashhad; and the Herbarium Research Centers of Natural Resources and Animal Affairs of Tabriz, Mashhad, Esfahan, Shiraz, Kerman, and Zahedan for making the herbarium facilities available for my study. I am grateful to Victoria Hollowell, Beth Parada, and Allison Brock (MO) for revising the manuscript, as well as for their useful comments and suggestions. I also thank Roy Gereau for checking the Latin and Mitra Hezarkhani for preparing the illustrations.

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A New Species in *Elaphoglossum* sect. *Elaphoglossum* subsect. *Pachyglossa* (Dryopteridaceae) from Costa Rica and Panama

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Abstract. A new species of *Elaphoglossum* Schott in section *Elaphoglossum* subsect. *Pachyglossa* Christ is described and illustrated here. *Elaphoglossum skutchianum* A. Rojas is recognized from Costa Rica and Panama, and occurs at middle elevations in the Cordillera de Tilarán, Cordillera Central, and Cordillera de Talamanca. It is distinguished from the closely related *E. brevissimum* Mickel by its longer fronds. It is here proposed that *E. lankesteri* Mickel is a synonym of *E. cismense* Rosenst.

Resumen. Una nueva especie de *Elaphoglossum* Schott de la sección *Elaphoglossum* subsect. *Pachyglossa* Christ es descrita e ilustrada aquí. *Elaphoglossum skutchianum* A. Rojas es conocida para Costa Rica y Panamá, y ocurre a elevaciones medias en la Cordillera de Tilarán, Cordillera Central y Cordillera de Talamanca. Esta es distinguible de la muy relacionada *E. brevissimum* Mickel por sus frondas más largas. Se propone que *E. lankesteri* Mickel es un sinónimo de *E. cismense* Rosenst.

Key words: Costa Rica, Dryopteridaceae, *Elaphoglossum*, IUCN Red List, subsect. *Pachyglossa*, Panama.

Based on my research on ferns of Costa Rica, the following species is described as new.

Elaphoglossum skutchianum A. Rojas, sp. nov. TYPE: Costa Rica. Alajuela: Cantón de Alajuela, Distr. Sarapiquí, Colonia Virgen del Socorro, orillas del Río Sarapiquí, ca. de la nueva represa, 10°15′30″N, 84°10′20″W, 720 m, 27 Dec. 2004, *A. Rojas & C. Frias 6311* (holotype, CR; isotypes, K, MO). Figures 1, 2.

Haec species ab *Elaphoglosso brevissimo* Mickel frondibus longioribus, stipite pro ratione longiore et lamina latiore basi cuneata differt.

Epiphytic; rhizome 4–8 mm diam., short-creeping; rhizome scales 4–8 × 0.8–1.5 mm, linear-lanceolate, dark yellowish brown to dark brown, occasionally with fimbriate margin; fronds (40–)55–90(–105) cm, to 12 mm apart; phyllopodia 20–35 mm; stipes 1/4–2/5 of the frond length; stipe scales 2–6 × 0.5–1.5 mm, lanceolate to linear-lanceolate, brown, patent, present only on base of stipe, margin occasionally long ciliate; blades 31–66 × 7–11.5 cm, elliptic, chartaceous to subcoriaceous, apex acuminate, base narrowly to broadly cuneate; hydathodes absent; blade scales 0.2–0.5 mm diam., fimbriate, brown to black, margin long ciliate to fimbriate; fertile fronds (27–)40–58 cm, shorter than the sterile fronds; stipe 2/5–3/5 of the frond length; fertile blade (12–)19–33 × 3–5.4 cm, lanceolate to elliptic, apex acute to acuminate, base cuneate; intersporangial scales absent.

Distribution. *Elaphoglossum skutchianum* is known from Costa Rica and Panamá, in the Cordillera de Tilarán, Cordillera Central, and the Caribbean slope of the Cordillera de Talamanca at 400–1200 (–1600) m elevation.

IUCN Red List category. The new species should be considered Data Deficient (DD) according to IUCN Red List criteria (IUCN, 2001) because the size of the population has not been assessed. However, the species is found in several national parks and other protected areas in Costa Rica and Panama and is most likely not at risk.

Etymology. This species is dedicated to the naturalist Alexander Frank Skutch (1904–2004), son-in-law of Charles Lankester.

Discussion. *Elaphoglossum skutchianum* resembles *E. brevissimum* Mickel in its rhizome scales and evident leaf veins; however, *E. skutchianum* differs in its longer fronds ([40–]55–90[–105] cm vs. 24–37 cm long), stipe 1/4–2/5 of the frond length (vs. 1/20–1/15), and broader lamina (7–11.5 cm vs. 3.5–6.2 cm wide) with a cuneate (vs. attenuate) base.

The new species also resembles *Elaphoglossum cismense* Rosenst. in frond length and size, but differs by its longer rhizome scales (4–8 mm vs. 1–3[–5] mm long), evident veins (vs. mostly obscure), fertile fronds shorter than the sterile fronds (vs. subequal or longer), lower altitudinal distribution ([100–]400–1200[–1600] m vs. 1600–2800[–3000] m), and epiphytic habitat (vs. epiphytic or more commonly terrestrial) (Fig. 2).

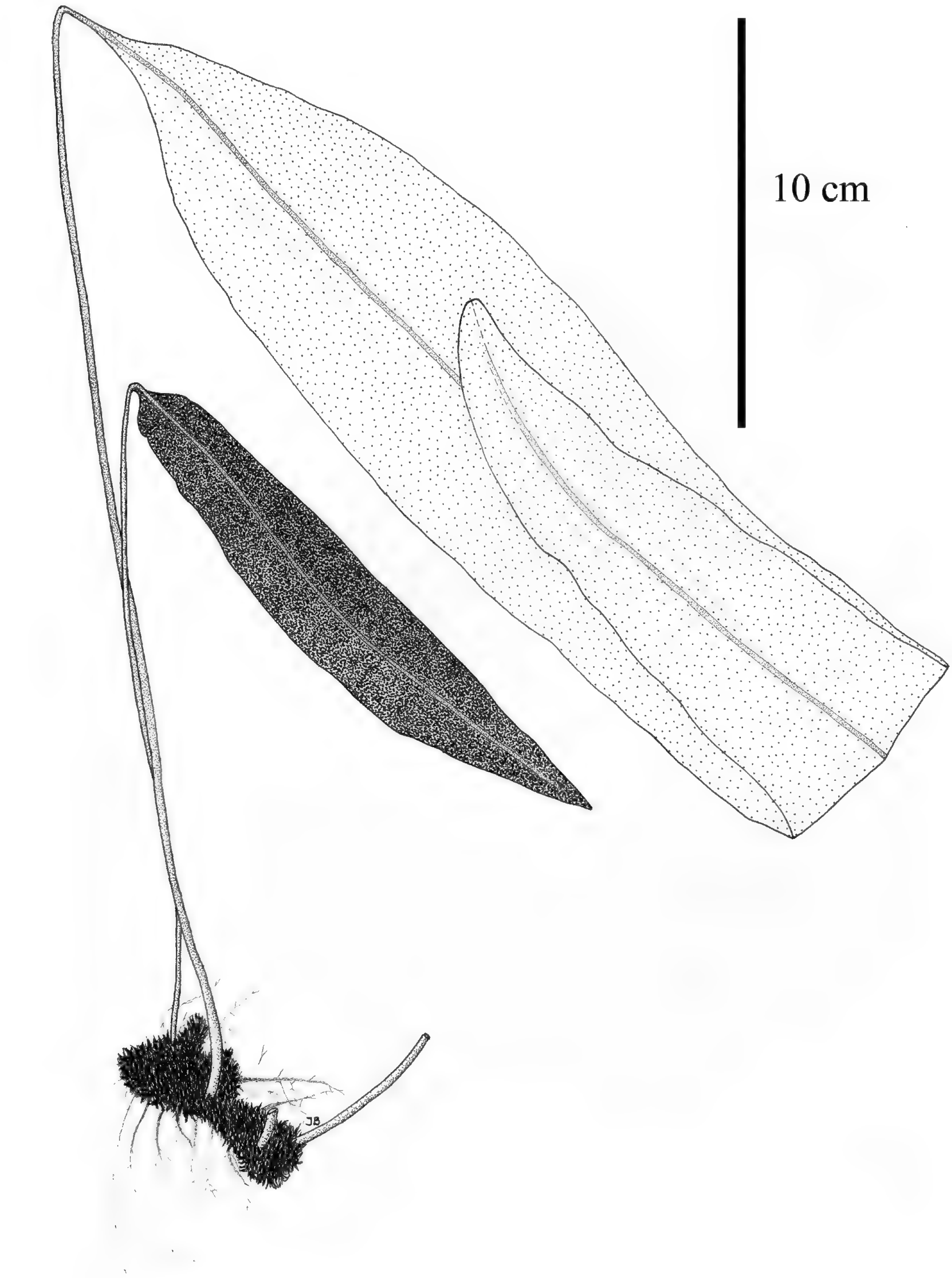

Figure 1. Habit of the type specimen of *Elaphoglossum skutchianum* A. Rojas (*Rojas & Frias 6311*, CR).

Elaphoglossum lankesteri Mickel has been considered distinct from *E. cismense* (Mickel, 1992, 1995); however, I find no appreciable differences between the two species. Accordingly, I consider the former name a synonym of the latter. Three paratypes of *E. lankesteri* (*Hammel et al. 17576*, NY; *Smith et al. 2272*, NY; and *Werff & Hardeveld 6617*, NY), however, represent the new species described in this paper, not *E. cismense*.

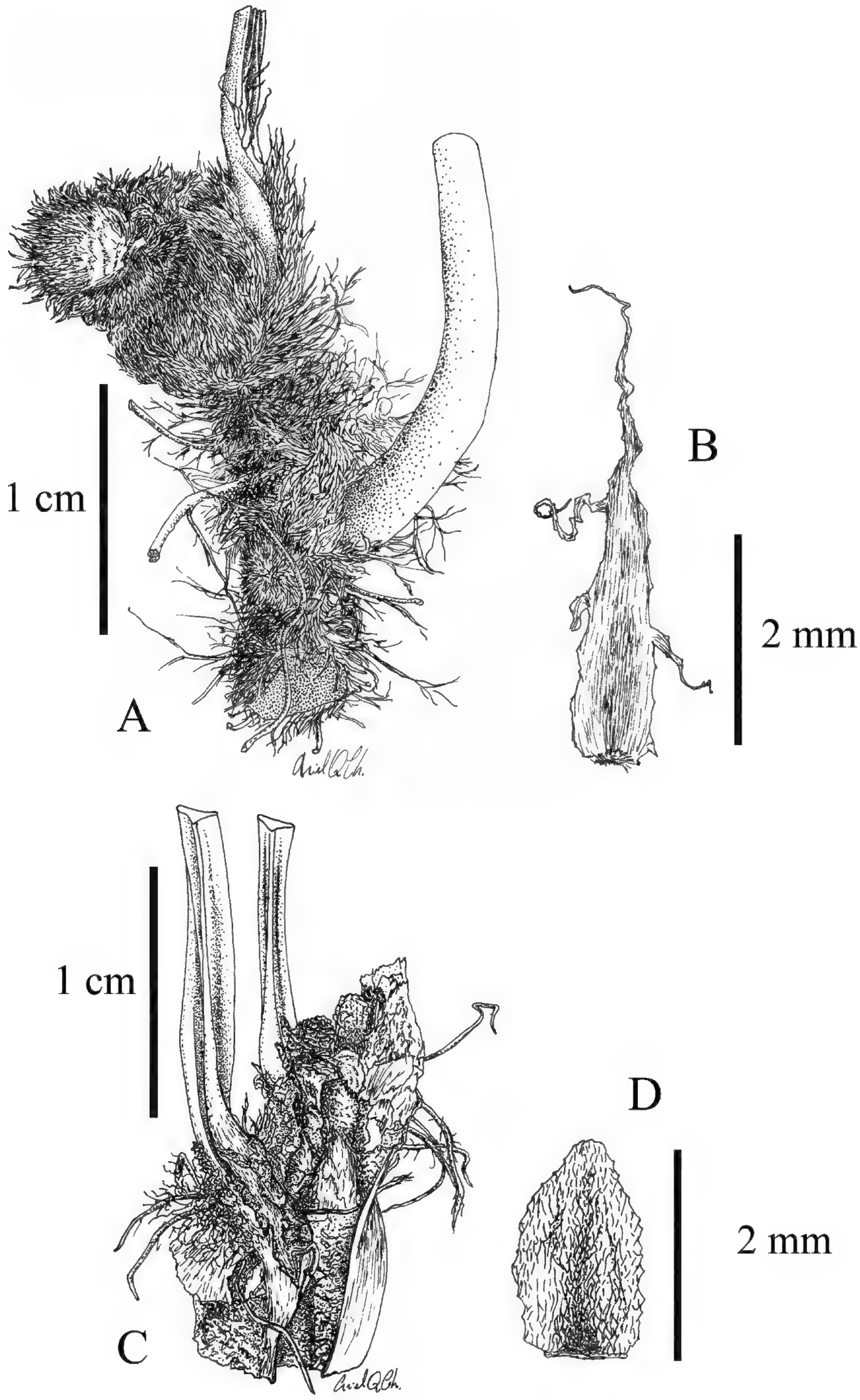

Figure 2. A, B. *Elaphoglossum skutchianum* A. Rojas, drawn from the type *Rojas & Frias 6311* (CR). —A. Rhizome detail. —B. Rhizome scale. C, D. *Elaphoglossum cismense* Rosenst., drawn from the representative specimen *Umaña & Chacón 565* (CR). —C. Rhizome detail. —D. Rhizome scale.

Following the infrageneric classification of *Elaphoglossum* Schott published by Mickel and Atehortúa (1980), the new species is included in section *Elaphoglossum* based on its linear to lanceolate rhizome scales, lack of hydathodes, and the leaf blades with minute stellate scales. It is more precisely placed in subsection *Pachyglossa* Christ based on its chartaceous to subcoriaceous leaf blades and distinct phyllopodia.

Paratypes. COSTA RICA. 23 May 1986, *I. Chacón 1892* (CR); Parque Nacional Braulio Carrillo, Quebrada Molinete, 13 Feb. 1984, *L. Gómez et al. 21091* (CR). **Alajuela:** Cantón de Alajuela, Cordillera Central, Sarapiquí, entre Cariblanco y Virgen del Socorro, y orillas del Río Sarapiquí, 10°15′25″N, 84°10′20″W, 21 Aug. 1994, *A. Rojas 1387* (CR, INB); Cantón de Alajuela, Cordillera Central, Cariblanco, camino a Virgen del Socorro y orillas del Río Sarapiquí, 10°15′25″N, 84°10′20″W, 22 Feb. 1995, *A. Rojas 1679* (CR, INB, MO); N slope of ridge along quebrada draining E to Río Cataratitas, ca. 20 km NW of San Ramón, 10°13′N, 84°32′W, 3 Feb. 1986, *A. Smith et al. 2272* (CR, MO, UC); Cantón de San Ramón, Dist. Ángeles Norte, Cordillera de Tilarán, Sendero el Polígono, 10°13′10″N, 84°35′20″W, 8 May 1996, *A. Soto et al. 8* (CR, INB). **Cartago:** Cantón de Turrialba, Tayutic, Jicotea, Finca La Pradera, subiendo la fila hacia San Antonio, 9°47′15″N, 83°33′15″W, 14 June 1995, *G. Herrera 7881* (CR, F, MO); Cantón de Turrialba, Cordillera Central, Tayutic, Jicotea, 9°47′15″N, 83°32′50″W, 22 June 1995, *A. Rojas et al. 2051* (CR, INB). **Limón:** Pococí, Guápiles, Parque Nac. Braulio Carrillo, Est. Quebrada González, Sendero Las Palmas, 10°09′44″N, 83°56′17″W, 14 May 2006, *A. Cascante & J. Sánchez 1567* (CR); Cantón de Talamanca, Bratsi, Sukut, desembocadura del Río Sukut en el Río Urén, camino al SE, hacia Purisqui, 9°23′30″N, 83°58′00″W, 7 July 1989, *B. Hammel et al. 17576* (CR, MO); Cantón de Pococí, Llanura de Santa Clara, Teleférico, de la calle a la estación, 10°10′22″N, 83°54′32″W, 21 July 1995, *A. Rojas & G. Rivera 2080* (CR, INB, MO); Cantón de Pococí, Parque Nac. Braulio Carrillo, Cordillera Central, Est. Quebrada González, Río Sucio, Sendero Botarrama, 10°09′58″N, 83°56′30″W, 9 May 1995, *A. Rojas et al. 1791* (CR, INB); Cantón de Limón, R. I. Chirripó, Fila Matama, Almirante, 09°46′12″N 083°19′48″W, 10 Aug. 1995, *A. Rojas et al. 2266* (INB, MO); Cantón de Pococí, Parque Nac. Braulio Carrillo, Est. Quebrada González, Sendero Palmas, 10°09′50″N, 83°56′20″W, 21 Nov. 1997, *A. Rojas et al. 3994* (CR, INB, MO); Pococí, Parque Nac. Braulio Carrillo, Sendero Botarrama, 0.5 km después del Río Sucio en la carretera en dirección a Guápiles, 10°09′00″N, 83°56′45″W, 12 Aug. 2001, *A. Rojas 5464* (CR, INB). PANAMA. **Chiriquí:** Dam site, 7 Feb. 1985, *H. van der Werff & C. Hardeveld 6617* (MO). **Veraguas:** vic. Escuela Agrícola Alto Piedra, near Santa Fe, along trail to top of Cerro Tute, 6 Oct. 1979, *T. Antonio 1978* (MO); vic. of Santa Fe, along road betw. Alto Piedra & Calovébora, 0.5 mi. N of Alto Piedra, on slopes of Cerro Tute, Parque Nac. Cerro Tute, 15 July 1994, *T. Croat & G. Zhu 76912* (MO).

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Three New Montane Forest Myrtaceae from Espírito Santo, Brazil

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Abstract. Three new species of Myrtaceae from montane forests of the southeastern Brazilian state of Espírito Santo are described, illustrated, and compared with related species: *Eugenia crassa* Sobral, *Myrcia santateresana* Sobral, and *M. tumida* Sobral. *Eugenia crassa* is closely affined to *E. umbrosa* O. Berg, from which it is set apart by the smaller and wider leaves (to 170 × 75 mm in *E. crassa* vs. to 200 × 50 mm), axillary inflorescences, and flowers with larger bracteoles (to 8 mm in *E. crassa* vs. to 2 mm); *M. santateresana* is related to *M. badia* (O. Berg) N. Silveira, from which the new species differs by its smaller leaves (to 140 × 50 mm in *M. santateresana* vs. to 200 × 50 mm) with discontinuous marginal veins and smaller (buds to 2 mm in *M. santateresana* vs. to 4 mm), glabrous flowers without a calyx tube; *M. tumida* is close to *M. guianensis* (Aubl.) DC., differing by its swollen calyx lobes, larger fruits (to 18 mm in *M. tumida* vs. to 10 mm), and longer petioles (to 13 mm in *M. tumida* vs. to 6 mm).

Resumo. São descritas e ilustradas três novas espécies de Myrtaceae da floresta ombrófila montana do Espírito Santo, Brasil: *Eugenia crassa* Sobral, *Myrcia santateresana* Sobral e *M. tumida* Sobral. *Eugenia crassa* é próxima de *E. umbrosa* O. Berg, diferindo pelas folhas menores e mais largas (até 170 × 75 mm em *E. crassa* vs. até 200 × 50 mm), inflorescências axilares e flores com bractéolas maiores (até 8 mm em *E. crassa* vs. até 2 mm); *M. santateresana* é próxima a *M. badia* (O. Berg) N. Silveira, diferindo pelas folhas menores (até 140 × 50 mm em *M. santateresana* vs. até 200 × 50 mm) com nervura marginal descontínua, flores glabras e menores (botões até 2 mm em *M. santateresana* vs. até 4 mm) e tubo do cálice ausente; e *M. tumida* é próxima a *M. guianensis* (Aubl.) DC., da qual difere pelas flores com lobos do cálice engrossados, frutos maiores (até 18 mm em *M. tumida* vs. até 10 mm) e pecíolos mais longos (até 13 mm em *M. tumida* vs. até 6 mm).

Key words: Brazil, Espírito Santo, *Eugenia*, IUCN Red List, *Myrcia*, Myrtaceae.

The central region of the southeastern Brazilian state of Espírito Santo (ca. 19°30′–20°00′S, 40°30′–41°00′W) presents a mountainous relief with altitudes up to 1200 m and was originally covered by dense forest (Atlantic rainforest). The region was intensely deforested, and presently only a few continuous forested areas survive (Mendes & Padovan, 2000). Botanical collections in this region are scarce, except for recent efforts of the Museu de Biologia Mello Leitão in Espírito Santo, with intensive surveys in the municipality of Santa Teresa and adjacent areas. During an inventory of the Myrtaceae in Santa Teresa, three undescribed species were detected and are here described and illustrated.

1. **Eugenia crassa** Sobral, sp. nov. TYPE: Brazil. Espírito Santo: Santa Teresa, Santo Antônio, terreno do Bosa, 14 Jan. 1999, *L. Kollmann & E. Bausen 1563* (holotype, MBML; isotype, BHCB). Figure 1.

Species haec *Eugeniae umbrosae* O. Berg proxima, a qua inflorescentiis axillaribus terminalibusve, bracteolis ellipticis deltoideisve majoribus et foliis aveniis minoribusque recedit.

Tree 10–12 m tall; twigs and abaxial side of young leaves with arachnoid rufescent trichomes to 0.2 mm, twigs apically terete or subquadrate, 5–8 mm thick. Leaves with petioles 15–18 × 2.8–4 mm; blades lanceolate to oblong, 140–170 × 45–75 mm, leathery, discolored when dry, adaxially glabrous, the abaxial side with trichomes that fall irregularly in mature leaves, apex widely acute to obtuse, base cuneate or obtuse; midvein plane or weakly sulcate adaxially, strongly raised and sometimes longitudinally wrinkled abaxially; lateral veins 12 to 16 on each side, scarcely or not visible on both sides, occasionally faintly raised abaxially; marginal vein 3–5 mm from the margin, occasionally a second vein ca. 1 mm, the margin itself strongly revolute and with a yellowish or brownish girdle 0.2–0.5 mm wide. Inflorescences axillary or terminal, racemiform (bracteate shoots sensu Landrum & Kawasaki, 1997), 5–20 × 2–5 mm, with 2 to 4 flowers. Flowers with pedicels 2–4 × ca. 2 mm; bracteoles concealing the ovary, elliptic or ovate, 7–8 × 6–8 mm, glabrous or sparsely covered with appressed rufescent trichomes 0.1–0.2 mm, persistent at anthesis; flower buds obpyriform, ca. 15 × 10–12 mm; ovary pilose, with densely appressed rufescent

Figure 1. *Eugenia crassa* Sobral, isotype specimen (*L. Kollmann & E. Bausen 1563*, BHCB).

trichomes to 0.1 mm, markedly distinct from the calyx lobes, these 4, glabrous, ovate-triangular, unequal, the external pair 7–8 × 10–12 mm and the internal pair 8–9 × ca. 10 mm; petals orbicular, 10–14 mm diam.; stamens ca. 200, 7–8 mm, anthers ovate-oblong, 1–1.3 × ca. 0.5 mm, with one apical gland (petals and stamens measured in pre-anthesal buds; in open flowers they may be larger); staminal ring rounded, ca.

10 mm diam.; style to 10 mm, stigma punctiform; ovary bilocular with ca. 30 ovules per locule. Fruits globose or somewhat oblate, 25–28 × ca. 30 mm, single-seeded, immature in the collections examined; seed globose-elliptic, 20–22 × ca. 20 mm; embryo with 2 fused cotyledons and no visible hypocotyl.

Distribution, habitat, and phenology. *Eugenia crassa* is a tree from Atlantic montane forests at altitudes of 750–800 m. The new taxon is currently known only from the municipality of Santa Teresa, and is noted to flower in January and fruit in October.

IUCN Red List category. According to IUCN Red List criteria (IUCN, 2001), *Eugenia crassa* is assessed here as Endangered (EN), fitting criteria B1ab(iii). Its known area of occurrence is smaller than 5000 km^2 (criterion B1), since the municipality of Santa Teresa has an area of 695 km^2 (IBGE, 2010), and it grows in a fragmented habitat (criterion a) with continuing decline in extension (criterion b[iii]), since only 18% of the area of Santa Teresa retains its original vegetation (Mendes & Padovan, 2000: 16).

Etymology. The specific epithet is taken from the Latin "crassus," meaning "thick," alluding to the overall aspect of the exsiccatae, with leathery leaves and robust twigs.

Taxonomic affinities. *Eugenia crassa*, due to the overall aspect of the leaves and the indumentum on the leaves and flowers, is apparently related to *E. umbrosa* O. Berg, a species collected in the nearby state of Rio de Janeiro (Berg, 1857–1859: 582). The two species can be distinguished by the characters described in the following key couplet:

1a. Inflorescences ramiflorous, the axes to 2 mm; bracteoles ovate, to 2 mm; leaves with petioles to 8 mm and blades 170–200 × 48–50 mm, the venation clearly manifest on both faces . . . . . *E. umbrosa*

1b. Inflorescences axillary or terminal, axes 5–20 mm; bracteoles elliptic or ovate, 7–8 mm; leaves with petioles 15–18 mm and blades 140–170 × 45–75 mm, the venation scarcely visible on both faces. . . . . *E. crassa*

Paratypes. BRAZIL. **Espírito Santo:** Santa Teresa, Santo Antônio, Terreno do Bosa, 7 Oct. 1998, *L. Kollmann, E. Bausen & W. Pizziolo 714* (MBML, MO), *L. Kollmann, E. Bausen & W. Pizziolo 718* (BHCB, MBML).

2. Myrcia santateresana Sobral, sp. nov. TYPE: Brazil. Espírito Santo: Santa Teresa, São Lourenço, Reserva Biol. de São Lourenço, trilha do Caravagem, 3 Feb. 1999, *L. Kollmann, E. Bausen & W. Pizziolo 1793* (holotype, MBML; isotype, BHCB). Figure 2.

Species haec *Myrciae badiae* (O. Berg) N. Silveira proxima, a qua foliis minoribus discoloribusque nervis marginalibus interruptis et floribus glabris minoribus hypanthio nullo recedit.

Tree 9–12 m tall; plants glabrous except for scattered simple hyaline trichomes 0.1–0.3 mm on the inflorescences; twigs ochraceous or pale yellow, moderately exfoliating, terete, 1–2 mm thick. Leaves with blades lanceolate to lanceolate-obovate, 80–140 × 35–50 mm, strongly discolorous in dried specimens, apex acute to acuminate, base cuneate; midvein sulcate adaxially and raised abaxially; lateral veins 12 to 15 at each side, evident on both faces and raised abaxially; marginal veins 2, the inner one somewhat discontinuous, 3–4 mm, the outer one ca. 1 mm from the margin; petioles 8–10 × 1.5–1.7 mm. Inflorescences terminal, paniculiform, up to 3 times ramified, the main axis 100–160 × 1–3 mm; bracts lanceolate, ca. 0.8 × 0.3 mm, occasionally persisting. Flowers sessile or with pedicels to 0.5 × 0.3 mm; bracteoles lanceolate, 0.5–0.7 × ca. 0.3 mm, deciduous at anthesis; flower buds globose to obovate, 1.5–2 × ca. 1.5 mm; calyx lobes 5, unequal in size, triangular to rounded, 1–1.5 × 1–2 mm, reflexed at anthesis; petals white, rounded to obovate, ca. 2 × 2 mm; stamens ca. 50 (mostly fallen; estimated by scars on the staminal ring), ca. 2 mm, anthers elliptic, ca. 0.4 × 0.2 mm, apparently devoid of apical glands; staminal ring rounded, 1–1.3 mm diam.; calyx tube absent; style 3–4 mm, stigma punctiform; ovary bilocular with 2 centrally attached ovules per locule. Fruits globose, 5–6 mm diam., immature in the collections examined; seeds 1 to 2, with membranous testa; embryo immature, not distinguishable.

Distribution, habitat, and phenology. *Myrcia santateresana* is a tree from montane forests at altitudes of 750–850 m. It is presently known only from the municipality of Santa Teresa. The new species was observed to flower in December and February, with fruits in March.

IUCN Red List category. This species can be considered as Endangered (EN), according to IUCN Red List criteria (IUCN, 2001), fitting criteria B1ab(iii); for an explanation of these criteria see the text under *Eugenia crassa*, since the conditions described for this species also apply to *Myrcia santateresana*.

Taxonomic affinities. *Myrcia santateresana*, due to the shape of its leaves and venation pattern, is apparently related to *M. badia* (O. Berg) N. Silveira, native from Bahia (Berg, 1857–1859: 547, as *Aulomyrcia badia* O. Berg). The two species can be distinguished by the characters described in the following key couplet:

1a. Leaves 150–200 × 35–55 mm, concolorous or not markedly discolored; lateral veins to 20 or more at

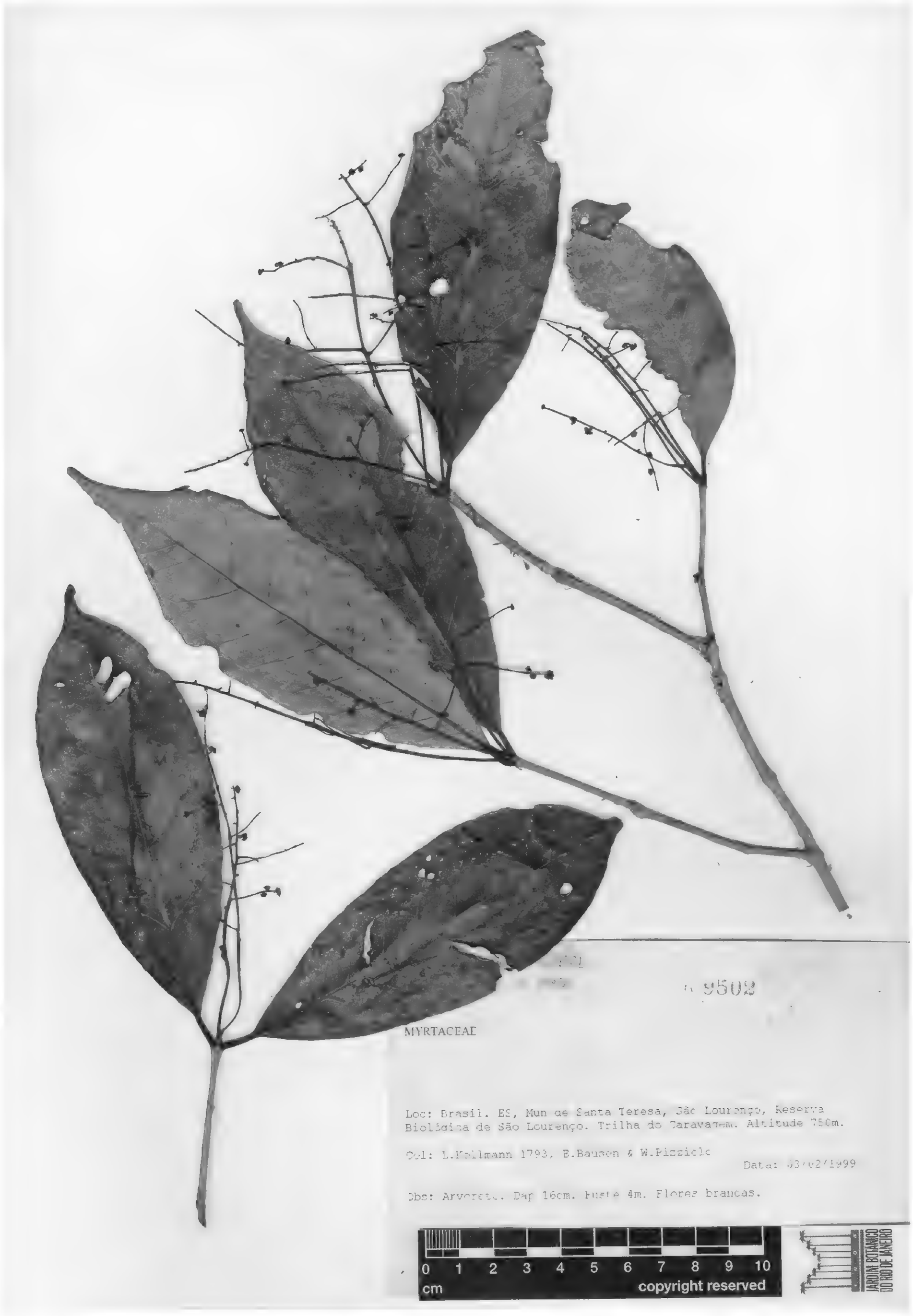

Figure 2. *Myrcia santateresana* Sobral, isotype specimen (*L. Kollmann, E. Bausen & W. Pizziolo 1793*, BHCB).

each side, forming a continuous marginal vein; flowers pilose, sessile at the apex of inflorescence branches; buds to 4 mm; calyx tube present . . . *M. badia*

1b. Leaves 80–140 × 35–50 mm, markedly discolorous; lateral veins to 15 at each side, forming a discontinuous inner marginal vein; flowers glabrous, sessile along the inflorescence branches; buds to 2 mm; calyx tube absent . . . . *M. santateresana*

Paratypes. BRAZIL. **Espírito Santo:** Santa Teresa, Reserva Biol. Caixa D'Água, trilha do Caravagem, 29 Dec. 1998, *L. Kollmann & E. Bausen 1371* (BHCB, MBML);

cabeceira do 25 de julho, terreno do Furlani, 11 Mar. 1999, *L. Kollmann, E. Bausen & W. Pizziolo 2153* (MBML, MO).

3. Myrcia tumida Sobral, sp. nov. TYPE: Brazil. Espírito Santo: Santa Teresa, Valsugana Velha, Reserva Biol. Santa Lúcia, 28 Jan. 1999, *L. Kollmann, E. Bausen & W. Pizziolo 1736* (holotype, MBML; isotype, BHCB). Figure 3.

Species haec *Myrciae guianensi* (Aubl.) DC. proxima, a qua florum lobis calycinis adaxialiter praesertim dimidio superiore planis vel convexis et tumidis, fructibus majoribus et petiolis longioribus recedit.

Shrub or treelet to 5 m tall; plants glabrous except for very scattered rufescent dibrachiate trichomes to 0.4 mm in young leaves and grayish or brownish simple trichomes ca. 0.1 mm at the adaxial side of calyx lobes; twigs terete, grayish or brownish, 1–2 mm thick. Leaves with petioles 10–13 × 1–1.2 mm; blades elliptic-oblong, oblong-obovate, or widely elliptic, 80–110 × 30–60 mm, concolorous or slightly discolored when dry and with evident glandular dots 0.1–0.2 mm diam., apex obtuse to widely acute, rarely retuse, base cuneate; midvein plane or sulcate, rarely slightly raised adaxially and evident abaxially; lateral veins 15 to 17 at each side, scarcely evident to weakly raised on both sides; marginal vein 1–2 mm from the sometimes revolute margin. Inflorescences with 3 to 7 flowers, sometimes reduced to only 1 flower, then the axis looking like a pedicel to 15 mm, more commonly racemiform or paniculiform, then ramified only once, the axis 35–65 × ca. 1.5 mm; flowers sessile or pedicels 2–2.5 × ca. 0.5 mm; bracteoles not seen; flower buds globose or obovate, 3–4 × ca. 4 mm, with visible glandular dots; calyx lobes ovate, erect at anthesis, sometimes unequal in size, 1–2 × ca. 2 mm, internally with trichomes to 0.1 mm, the apex adaxially plane or convex, in this case seeming a little swollen and to 1 mm thick; petals white, rounded or obovate, 3–4 × 2–3 mm; stamens ca. 80, 4–5 mm, the anthers globose, ca. 0.3 × 0.3 mm, with one apical gland; calyx tube present, 0.8–1 mm deep; style 7–8 mm, the stigma punctiform and finely papillate; ovary 3-locular, with 2 centrally attached ovules per locule. Fruits globose or oblate, yellowish as far as known, 10–17 × 10–18 mm; seeds widely reniform, to 10 × 7–8 mm, the testa brown, shining; embryo with 2 folded cotyledons and hypocotyl.

Distribution, habitat, and phenology. *Myrcia tumida* is a tree from Atlantic montane forests at altitudes from 600–950 m. It has been collected only from the municipalities of Santa Leopoldina and Santa Teresa. The new species flowers in January and fruits in May and July.

IUCN Red List category. According to IUCN Red List criteria (IUCN, 2001), this species can be considered as Endangered (EN), fitting criteria B1ab(iii), since its known area of occurrence is smaller than 5000 km² (criterion B1), and since the municipalities of Santa Leopoldina and Santa Teresa have, respectively, areas of 716 km² and 695 km² (IBGE, 2010). *Myrcia tumida* grows in a fragmented habitat (criterion a) with a continuing decline in extension (criterion b[iii]), since only 18% of the area of Santa Teresa still retains its original vegetation (Mendes & Padovan, 2000: 16) and, since the occupation history and land use of the municipality of Santa Leopoldina is similar, possibly only a small part of its original vegetation has remained.

Etymology. The specific epithet is taken from the Latin "tumidus," meaning "swollen," alluding to the form of the calyx lobes.

Taxonomic affinities. *Myrcia tumida*, due to the form of its leaves and venation, is related to the widespread *M. guianensis* (Aubl.) DC. The two species can be distinguished by the characters described in the following key couplet:

1a. Calyx lobes uniformly concave, never swollen and complanate distally; mature fruits globose, to 10 mm diam.; leaves with blades to 70 × 20 mm and petioles to 6 × 1 mm . . . . . *M. guianensis*

1b. Calyx lobes concave only proximally or not concave at all, swollen and complanate to convex distally; mature fruits globose or oblate, 10–17 × 10–18 mm; leaves with blades to 110 × 60 mm and petioles to 13 × 1.2 mm . . . . . *M. tumida*

Paratypes. BRAZIL. **Espírito Santo:** Santa Leopoldina, Cachoeira da Fumaça, 3 July 1984, *W. Boone 245* (BHCB, MBML); Santa Teresa, mata do Tabajara, Jan. 1997, *M. Sobral, C. Bassi, H. Boudet Fernandes & G. Hupp 8277* (BHCB, K, MBM, MO); Cabeceira do rio Bonito, radar, 31 Jan. 2002, *L. Kollmann & E. Bausen 5451* (BHCB, MBML); Nova Lombardia, Reserva Biológica Augusto Ruschi, trilha da divisa, 24 May 2002, *R. Vervloet, W. Pizziolo & E. Bausen 287* (MBML, MO), 10 Apr. 2003, *R. Vervloet, E. Bausen & W. Pizziolo 2217* (MBML), 28 July 2004, *L. Kollmann* 6598 (MBML).

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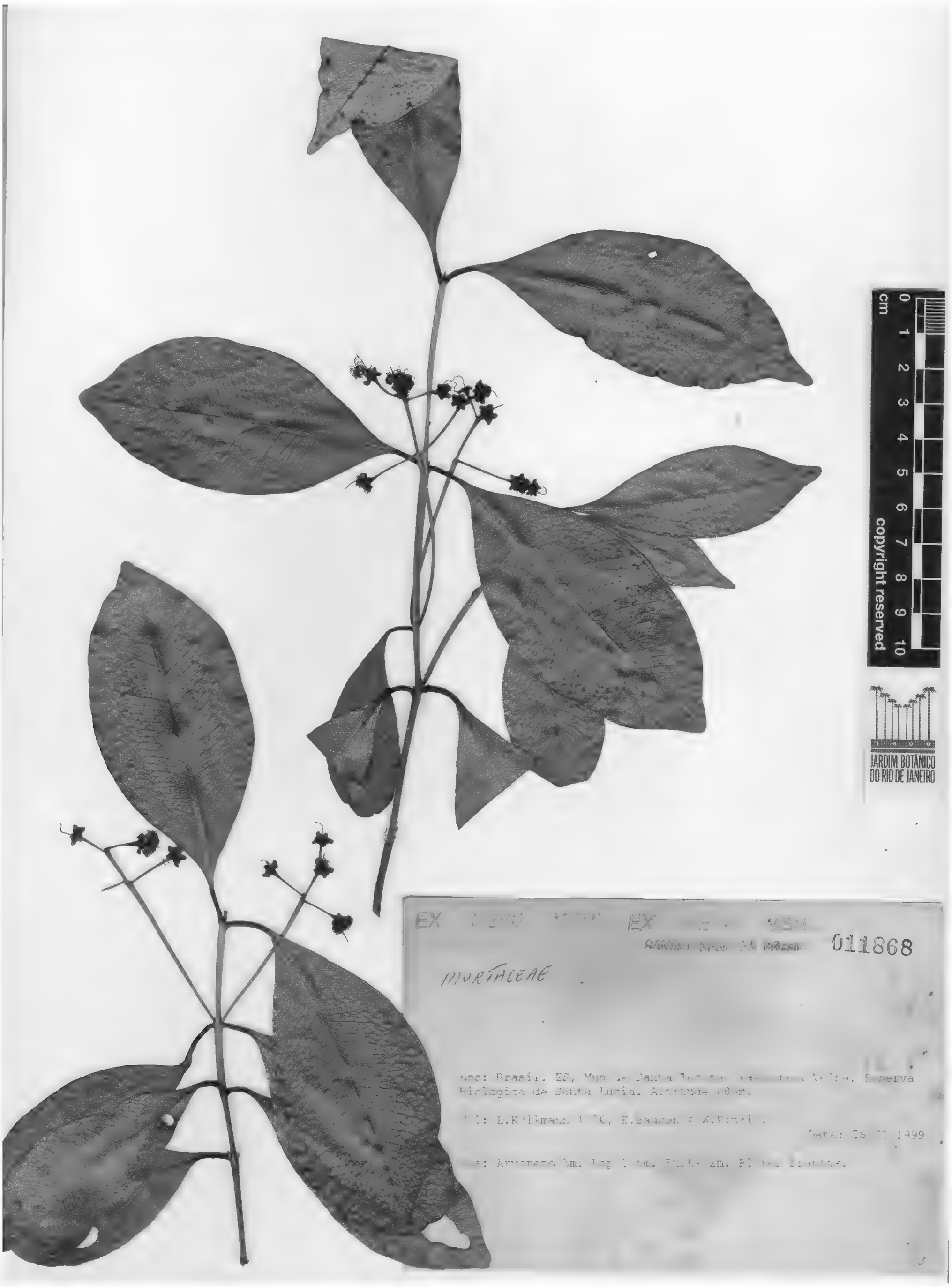

Figure 3. *Myrcia tumida* Sobral, isotype specimen (*L. Kollmann, E. Bausen & W. Pizziolo 1736*, BHCB).

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Myrcia concisa (Myrtaceae), a New Species from Minas Gerais, Brazil

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Abstract. *Myrcia concisa* Sobral & Leoni, a new species of Myrtaceae from rainforests of the south-eastern Brazilian state of Minas Gerais, is described, illustrated, and evaluated for its conservation status according to IUCN criteria. The new species is apparently related to *M. pubescens* DC., from which it is set apart by the narrower blades and uniflorous to triflorous inflorescences.

Resumo. *Myrcia concisa* Sobral & Leoni, uma nova espécie de Myrtaceae das florestas ombrófilas do estado de Minas Gerais, na região sudeste do Brasil, é descrita, ilustrada e avaliada em seu status de conservação de acordo com os critérios da IUCN. A nova espécie é considerada próxima a *M. pubescens* DC., da qual se distingue pelas lâminas mais estreitas e inflorescências unifloras ou trifloras.

Key words: Brazil, IUCN Red List, Minas Gerais, *Myrcia*, Myrtaceae.

The American genus *Myrcia* DC. ex Guill. (Myrtaceae) has a distribution ranging from the Antilles to Uruguay and comprises about 350 species, with at least 230 species in Brazil (Govaerts et al., 2010).

During the floristic inventory of two rainforest reserves in eastern Minas Gerais (Lombardi & Gonçalves, 2000), a fruiting species of Myrtaceae was collected and tentatively identified as *Gomidesia* O. Berg sp. 1; the specimen differed from all previously known species of *Gomidesia* by its pauciflorous inflorescences. Recently, flowers of this species were collected, which allowed us to consider this species as previously undescribed, and we describe the new species below.

The genus *Gomidesia* was erected (Berg, 1855–1856) to accommodate species previously included in *Myrcia* in which stamens presented the interior staminal sac of each theca opening extrorsely and apically, and the exterior sac opening introsely and basally (vs. longitudinally dehiscent in the other species of *Myrcia*; McVaugh, 1968). Some authors challenged the independence of *Gomidesia* as a genus, frequently merging Berg's species in *Myrcia* (e.g., Kiaerskou, 1893; Niedenzu, 1893), while other authors accepted Berg's concept (Legrand, 1958; McVaugh, 1968; Mattos, 1984). Recently, Landrum and Kawasaki (1997) stressed the close affinity of *Gomidesia* and *Myrcia* and considered the first genus as a synonym of *Myrcia* in their generic treatment of Brazilian Myrtaceae. Furthermore, the results of Lucas et al. (2007) demonstrate that the species of *Gomidesia* are clearly nested within the genus *Myrcia*, although forming a monophyletic assemblage within it. We follow these results here and consider the presently described species as belonging to the genus *Myrcia*, rather than recognizing *Gomidesia* as a distinct genus.

Myrcia concisa Sobral & Leoni, sp. nov. TYPE: Brazil. Minas Gerais: Mun. Faria Lemos, Faz. Santa Rita, 16 Jan. 2006, *L. Leoni 6364* (holotype, GFJP; isotype, BHCB). Figure 1.

Species haec *Myrciae pubescenti* DC. proxima, a qua foliis angustioribus et inflorescentiis paucifloris recedit.

Shrubs 1.5–3 m tall; twigs cylindrical or slightly complanate, with brown or gray simple trichomes 0.5–1 mm, the most distal internodes 12–20 × ca. 1 mm, apically with acicular colleters to 1 × 0.05 mm. Leaves with petioles 3–5 × 0.5–0.6 mm; blades lanceolate to oblong, sometimes lanceolate-obovate, 45–80 × 20–25 mm, 2–4 times larger than wide, discolored when dry, with simple erect trichomes to 0.5 mm, scattered adaxially, more dense and uniform abaxially, with translucid glandular dots smaller than 0.1 mm diam., ca. 10 per mm^2, evident when observed against a source of light, but scarcely visible otherwise, apex and base acute to obtuse; midvein sulcate adaxially and convex abaxially; lateral veins 10 to 14 per side, moderately sulcate adaxially and convex abaxially, leaving the midvein at angles 70°–

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Figure 1. *Myrcia concisa* Sobral & Leoni. —A. Isotype at BHCB. —B. Detail of flowers. A, B taken from *Leoni 6364*; scale in B = 10 mm.

80°; marginal vein to 0.9 mm from the revolute margin, the margin itself revolute. Inflorescences axillary, uniflorous or triflorous, then the flowers crowded apically, the lateral ones sessile, the axis 7–18 × 0.2–0.4 mm, densely covered with trichomes to 0.5 mm; bracts linear, to 2 × 0.3 mm, deciduous; pedicels absent (although in uniflorous inflorescences the axis may be confused with a pedicel); bracteoles

narrowly triangular, ca. 0.8 × 0.3 mm, deciduous before anthesis; flower buds globose to obovate, 3–4 × ca. 3 mm diam., uniformly covered with gray or ochraceous trichomes to 0.5 mm; calyx lobes hemispheric, 0.4–0.5 × 1.5–1.8 mm, pilose on both faces, adaxially with appressed trichomes to 0.2 mm, abaxially with trichomes to 0.5 mm; petals rounded, to 4 mm diam.; stamens ca. 80, 3–5 mm, anthers oblong, ca. 1 × 0.3–0.4 mm, eglandular, thecae asymmetrical, opening apically; staminal ring to 3 mm diam., with trichomes to 0.2 mm; calyx tube to 0.5 mm deep; style to 5 mm, with white trichomes 0.2–0.3 mm in proximal half; stigma punctiform; ovary with 2 locules and 2 ovules per locule. Fruits globose, to 5–6 mm diam., immature; seeds immature, with 2 distinct cotyledons and a well-developed hypocotyl.

Distribution and habitat. *Myrcia concisa* is a shrub from the interior of semideciduous forests from eastern Minas Gerais, in the Atlantic rainforest biome of southeastern Brazil, growing at altitudes of 680–710 m above sea level.

IUCN Red List category. This species is assessed here as Vulnerable (VU) according to IUCN Red List criteria (IUCN, 2001), fitting criteria B1ab(iii). Its known area of occurrence is smaller than 20,000 km^2 (criterion B1), and it grows in a severely fragmented habitat (criterion a) that is subject to a continuing decline in area, extent, and quality (criterion b[iii]). The places where this species was collected have been suffering intense deforestation and substitution of native forests by *Eucalyptus* L'Hér. plantations.

Phenology. Flowers of the new species were collected in December and January, and fruits were collected in April.

Etymology. The specific epithet is derived from the Latin "concisa," meaning "concise" or "brief," alluding to the very small number of flowers in the inflorescences of this new species.

Taxonomic affinities. This species is apparently related to *Myrcia pubescens* DC. (for a description, see Berg, 1857–1859), from which it can be distinguished by its narrower blades (up to two times longer than wide in *M. pubescens* vs. up to four times longer than wide in *M. concisa*) and inflorescences with one to three flowers (vs. at least 20 flowers in *M. pubescens*).

Paratypes. BRAZIL. **Minas Gerais:** Mun. Caratinga, Estação Biol. de Caratinga, 6 July 1987, *I. R. Andrade & L. V. Costa 65* (BHCB), 7 July 1987, *I. R. Andrade & L. V. Costa 161* (BHCB), 21 Apr. 1987, *M. A. Lopes & P. M. Andrade 263* (BHCB); Mun. Faria Lemos, Fazenda Santa Rita, 17 Dec. 2005, *Leoni 6348* (BHCB, GFJP), 7 Apr. 2004, *Leoni 5669* (BHCB, GFJP).

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Eugenia goiapabana (Myrtaceae), a New Species from Espírito Santo, Brazil

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ABSTRACT. *Eugenia goiapabana* Sobral & Mazine, a new species of Myrtaceae from Espírito Santo, eastern Brazil, is described, illustrated, and has its conservation status evaluated. The new species morphologically resembles *E. bocainensis* Mattos, from which it differs by its glabrous, acute leaves, racemiform inflorescences, and glabrous calyx lobes.

RESUMO. *Eugenia goiapabana* Sobral & Mazine, uma nova espécie de Myrtaceae do estado brasileiro de Espírito Santo, é descrita, ilustrada e avaliada quanto a sua conservação. A nova espécie é próxima de *E. bocainensis* Mattos, da qual se distingue pelas folhas glabras de ápice agudo, inflorescências racemiformes e lobos do cálice glabros.

Key words: Brazil, Espírito Santo, *Eugenia*, IUCN Red List, Myrtaceae.

Eugenia L. (Myrtaceae) is a widespread tropical genus with about 350 species in Brazil (Govaerts et al., 2010). The genus is especially frequent in the Atlantic coastal rainforests in Brazil (Thomaz & Monteiro, 1997; Negrelle, 2002; Amorim et al., 2005; Jesus & Rolim, 2005). During our examination of collections from the montane rainforests in central Espírito Santo, we found a distinctive species of *Eugenia* that we here propose as new.

Eugenia goiapabana Sobral & Mazine, sp. nov. TYPE: Brazil. Espírito Santo: Mun. Santa Teresa, Nova Lombardia, Reserva Biol. Augusto Ruschi, Tracomal, 19 Dec. 2002, *R. R. Vervloet, E. Bausen & W. Pizziolo 1580* (holotype, MBML; isotype, BHCB). Figure 1.

Species haec *Eugeniae bocainensi* Mattos proxima, a qua foliis glabris discoloribus apice acutis, inflorescentiis racemiformibus et bracteolis calyceque glabris recedit.

Tree 5–10 m tall; plants with scattered simple trichomes to 0.2 mm on the abaxial surface of young blades and densely appressed trichomes to 0.1 mm on the ovaries and occasionally on the inflorescences. Petioles 6–10 × 1–1.2 mm. Leaf blades narrowly elliptic to lanceolate, 45–85 × 15–40 mm, discolorous, somewhat dull abaxially, translucid glandular dots < 0.1 mm diam., ca. 30 per mm², occasionally visible on both sides, apex acute to broadly acute, base cuneate; midvein plane or sulcate adaxially and convex abaxially; lateral veins 15 to 18 per side, departing at 60°–70° from the midvein, scarcely visible adaxially and faint abaxially; marginal vein 1–2.5 mm from the margin, occasionally a second marginal vein 0.2–0.5 mm from margin. Inflorescences terminal, racemiform, with 4 to 6 flowers, the axis 20–30 × 1–2 mm, sometimes with densely appressed ochraceous, arachnoid trichomes to 0.1 mm; pedicels 5–10 × 0.8–1 mm; bracteoles glabrous, widely ovate to cordate, 6–8 × 4–6 mm, persisting after anthesis; flower buds not seen. Ovary externally densely covered with appressed ochraceous, arachnoid trichomes to 0.1 mm; calyx lobes glabrous, unequal, the external ones ovate, 6–7 × ca. 5 mm, the internal ones elliptic or ovate-elliptic, 7–9 × 4–6 mm, widely spreading at anthesis, the margin sometimes slightly revolute; petals rounded or widely ovate, 9–10 × ca. 8 mm, somewhat fleshy, as thick as the calyx lobes; stamens 150 to 180, filaments 6–9 mm, anthers oblong or elliptic-ovate, to 1 × 0.5 mm, with 1 apical gland to 0.1 mm and 1 to 3 glands to 0.05 mm adaxially; staminal ring subquadrate to 5 mm diam.; style to 10 mm, stigma punctiform and papillose, papillae < 0.05 mm; ovary 2-locular, ovules 16 to 20 per locule. Fruits globose, yellow when mature, 12–16 mm diam.; seeds reniform, 11–12 × ca. 10 mm, testa dull with a darker, slightly elevated dorsal crest to 4 mm wide, with cotyledons fused with no visible hypocotyl.

Distribution and habitat. *Eugenia goiapabana* is a small tree growing in rainforests and secondary forests in the mountainous region of central Espírito Santo, at altitudes of 800–1600 m above sea level. At

Figure 1. *Eugenia goiapabana* Sobral & Mazine. —A. Isotype at BHCB. —B. Detail of flower, with one calyx lobe detached and bracteole displaced to show the externally pilose ovary. A, B taken from *Vervloet et al. 1580*; scale in B = 10 mm.

present it is known from the municipalities of Fundão, Santa Teresa, and Castelo.

IUCN Red List category. *Eugenia goiapabana* should be considered Endangered (EN) following IUCN Red List criteria B1ab(iii) (IUCN, 2001). Its known range is less than 5000 km^2 (criterion B1), since the municipalities of Castelo, Fundão, and Santa Teresa, including the area of other municipalities between them where the species was not collected but

may possibly be found, occupy an area of ca. 3000 km^2 (see data and map in IBGE, 2010). It occurs only in severely fragmented habitats (criterion a) (Aguiar et al., 2005: 121), and its habitat is in continuing decline (criterion b[iii]), since most municipalities in central Espírito Santo have been intensely deforested and only very small areas retain their original vegetation. For example, Mendes and Padovan (2000: 16) report that only 18% of the municipality of Santa Teresa still retains its original vegetation.

Phenology. Flowers were collected in December through February and fruits in March through July.

Etymology. The specific epithet is derived from the locality of Goiapaba-Açu, in the municipality of Fundão, where one of the first collections of this species was made.

Taxonomic affinities. This species appears to be related to *Eugenia bocainensis* Mattos (for description see Berg, 1857–1859: 592, under *Phyllocalyx ligustrinus* O. Berg), a species native to Rio de Janeiro, from which it is distinguished by the characters described in the following key couplet:

1a. Leaf blades (at least when young) with scattered trichomes abaxially, concolorous, apex acuminate; flowers solitary or 2 per axile, without a well-developed axis; bracteoles pilose; flowers uniformly pilose . . . . . *E. bocainensis*

1b. Leaf blades glabrous adaxially and abaxially, discolourous, apex acute; flowers up to 6, along a visibly developed racemiform axis; bracteoles glabrous; flowers with trichomes restricted to the ovaries . . . . . *E. goiapabana*

Paratypes. BRAZIL. **Espírito Santo:** Mun. Castelo, Parque Estadual do Forno Grande, localidade de Bateias, 20°31′37″S, 41°06′06″W, 13 Feb. 2008, *R. C. Forzza, C. N. Fraga, L. Kollmann, A. P. Fontana & P. H. Labiak 4999* (BHCB, CEPEC, MBML, R, UPCB), 18 Aug. 2008, *A. P. Fontana, L. Kollmann, C. N. Fraga, P. Labiak, R. Goldenberg, P. Vianna & M. Saavedra 5419* (BHCB, CEPEC, MBML, R, UPCB); Mun. Fundão, Goiapaba-Açu, 15 July 1998, *L. Kollmann, E. Bausen & W. Pizziolo 219* (BHCB, MBML), 25 July 2000, *V. Demuner 1227* (BHCB, MBML); Mun. Santa Teresa, Penha, sítio do Zurlo, 9 July 1998, *L. Kollmann, E. Bausen & W. Pizziolo 204* (BHCB, MBML); Nova Lombardia, Reserva Biol. Augusto Ruschi, 19 Dec. 2002, *R. R. Vervloet, E. Bausen & W. Pizziolo 1580* (MBML); Reserva Biol. Augusto Ruschi, divisa, represa, 21 Jan. 2003, *R. R. Vervloet, E. Bausen & W. Pizziolo 1686* (BHCB, MBML).

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Rubiacearum Americanarum Magna Hama Pars XXIII: Overview of the Guettardeae Tribe in Central and South America, with Five New Species and Three New Combinations in *Chomelia*, *Neoblakea*, *Pittoniotis*, and *Stenostomum*

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Abstract. Delimitation of genera in the Neotropical tribe Guettardeae (Rubiaceae) has varied; here a key outlines the current taxonomy in South America and southern Central America. Three new species of *Chomelia* Jacq. are described and illustrated: the unarmed species *C. chiquitensis* C. M. Taylor of deciduous vegetation in eastern Bolivia differs from *C. sericea* Müll. Arg. of Bahia, Brazil, in its linear bracts and shorter corollas; the spiny species *C. costaricensis* C. M. Taylor of humid vegetation in northern Costa Rica differs from *C. microloba* Donn. Sm. in its longer corolla and lack of domatia on the leaves; and the unarmed species *C. torrana* C. M. Taylor of wet montane vegetation in northwestern Colombia is distinguished by its short inflorescences with red-violet corollas and its leaves with the higher-order venation not visible. A second species of *Neoblakea* Standl., *N. ecuadorensis* C. M. Taylor of seasonal vegetation in western Ecuador, differs from *N. venezuelensis* Standl. in its leaves broadly obtuse to rounded at the base and its larger fruits. A second species of *Pittoniotis* Griseb., *P. rotata* C. M. Taylor, is described based on a specimen from Ecuador and is also known from Peru; it differs from *P. trichantha* Griseb. of seasonal lowland vegetation in the Caribbean basin in its corollas with shorter tubes, its larger fruits, and its habitat in wet premontane vegetation. The genus *Stenostomum* C. F. Gaertn. has been recently circumscribed to include several Neotropical species, and three additional species are here transferred to it: *Chione darienensis* Dwyer, as *S. darienense* (Dwyer) C. M. Taylor; *Guettarda acreana* K. Krause, as *S. acreanum* (K. Krause) C. M. Taylor; and *G. turrialbana* N. Zamora & Poveda, as *S. turrialbanum* (N. Zamora & Poveda) C. M. Taylor. Conservation status assessments are presented for all of these species except *G. acreanum*, which is widespread and in need of further study.

Resumen. La delimitación de los géneros de la tribu neotropical Guettardeae (Rubiaceae) ha variado; aquí se presenta una clave que delinea la actual taxonomía en América del Sur y el sur de América Central. Se describen e ilustran tres nuevas especies de *Chomelia* Jacq.: la especie inerme *C. chiquitensis* C. M. Taylor de vegetación caducifolia del este de Bolivia difiere de *C. sericea* Müll. Arg. de Bahia, Brasil, por sus brácteas lineares y corolas más cortas; la especie espinosa *C. costaricensis* C. M. Taylor de vegetación húmeda del norte de Costa Rica difiere de *C. microloba* Donn. Sm. por su corola más larga y la ausencia de domacios en las hojas; y la especie inerme *C. torrana* C. M. Taylor de vegetación húmeda montana del noroeste de Colombia se distingue por sus inflorescencias cortas con corolas de un rojo-violeta y sus hojas con la nervadura de orden mayor no visible. Una segunda especie de *Neoblakea* Standl., *N. ecuadorensis* C. M. Taylor, de vegetación estacional del oeste de Ecuador difiere de *N. venezuelensis* Standl. en sus hojas ampliamente obtusas a redondeadas en la base y los frutos más grandes. Una segunda especie de *Pittoniotis* Griseb., *P. rotata* C. M. Taylor, se describe de una muestra de Ecuador y también es conocida de Perú, y difiere de *P. trichantha* Griseb. de la vegetación de tierras bajas estacional del Caribe por sus corolas con tubos más cortos, sus frutos más grandes y su hábitat de vegetación premontana húmeda. El género *Stenostomum* C. F. Gaertn. se ha circunscrito recientemente para incluir varias especies neotropicales, y aquí se transfieren tres especies adicionales: *Chione darienensis* Dwyer, como *S. darienense* (Dwyer) C. M. Taylor; *Guettarda acreana* K. Krause, como *S. acreanum* (K. Krause) C. M. Taylor; y *G. turrialbana* N. Zamora & Poveda, como *S. turrialbanum* (N. Zamora & Poveda) C. M. Taylor. Se presentan evaluaciones del estado de conservación para todas estas especies excepto *G. acreanum*, que está muy extendida y necesita de más estudio.

Key words: *Allenanthus*, Bolivia, Cerro del Torrá, *Chione*, *Chomelia*, Colombia, Costa Rica, Ecuador, *Guettarda*, Guettardeae, IUCN Red List, *Machaonia*,

Malanea, *Neoblakea*, Panama, Peru, *Pittoniotis*, Rubiaceae, *Stenostomum*.

During ongoing study of Neotropical Rubiaceae species for several flora projects, the new species described below and the need for the new combinations made below were discovered. These species were found through floristic exploration of several tropical regions that are not well known to science and have added information about several genera that are not well known to science.

Genera of Guettardeae are distinguished within Rubiaceae by their interpetiolar stipules that are usually (though not always) densely strigose to sericeous adaxially; the lack of raphides in their tissues; their inflorescences that are sometimes terminal but usually axillary and paired at the nodes; their 2- to multi-locular ovaries with the ovules solitary and pendulous from the top in each locule; and their fruits that are drupaceous with one multilocular pyrene, or in the Neotropics also dry and schizocarpous in *Allenanthus* Standl. and *Machaonia* Bonpl. (or elsewhere sometimes drupaceous with two to numerous unilocular pyrenes). Additionally, species of Guettardeae are often, though certainly not always, characterized by leaves with the tertiary and/or quaternary venation lineolate or very regularly areolate, inflorescences with the axes scorpioid and the flowers sessile, salverform corollas with well-developed tubes and the lobes sometimes crisped to appendaged, and succulent fruits. The Guettardeae are widespread in the Neotropics and well represented here, with probably as many species found in seasonal and dry forest as in wet forest, while the reverse is the more common pattern among Rubiaceae in this region. In the Neotropics most if not all the species appear to be distylous, though sometimes without markedly different positions of the anthers or stigmas between the two floral forms (Faivre & McDade, 2001). Many species of Guettardeae have a well-developed, unequal, presumably seasonal growth form. In these species, the stems terminate in several nodes that produce leaves and are separated by relatively short internodes, then growth from this apex stops and prolongation of the stem continues from a lower node where an axillary bud produces several elongated, often arching internodes. This new stem then repeats this pattern, producing several leaf-bearing nodes separated by relatively short internodes and then terminating with growth continuing from a lower node. This characteristic growth form is found in a number of Rubiaceae that belong to other tribes as well.

The genera of Guettardeae with the ovules and seeds solitary in each locule known from Central and South America are currently separated taxonomically as outlined in the key below. Robbrecht and Manen (2006) differed from some, though not all, previous authors in including *Allenanthus* in Guettardeae, and this genus is included in the key below. Several additional genera with ovules and seeds several to numerous per locule were also included in Guettardeae by Robbrecht and Manen and by Rova et al. (2002, based on what they described as weak support), in particular *Gonzalagunia* Ruiz & Pav., *Arachnothryx* Planch., and *Rogiera* Planch. However, the inclusion of these other genera in this tribe is controversial (Achille et al., 2006), and they are not included in the key here. The roman numerals in the key below identify the genera that are discussed further in this article and their order of presentation.

Limits and correct names of the genera in this tribe are still problematic, and taxonomic stability most likely will not be reached in the imminent future; however, the current provisional classification represents an advance and a useful basis for floristic work. Many Neotropical Rubiaceae species with imbricate corolla lobes and drupaceous fruits were previously included in the polymorphic, poorly defined genus *Antirhea* Comm. ex Juss., but Chaw and Darwin (1992) restricted this genus to its Paleotropical species and included those Neotropical species variously in several wholly Neotropical genera, notably *Pittoniotis* Griseb. and *Stenostomum* C. F. Gaertn. Achille et al. (2006) suggested, based on molecular analysis, that *Guettarda* L. and *Stenostomum* are polyphyletic as currently circumscribed and will eventually be subdivided. However, their study presented a first broad overview of the tribe based on necessarily limited sampling of species, and their results were not all strongly supported; consequently, they did not make new combinations or outline new generic circumscriptions. Additional comments about characters and circumscription of the individual genera treated here are presented below, in the discussion of the corresponding genus.

The descriptions and measurements here are based primarily on dried herbarium specimens. Flower buds of Rubiaceae species often open prematurely in the press at a smaller size than fully developed flowers and the succulent fruits often shrink when dried, so the measurements of herbarium specimens may differ from those of living plants. High-resolution digital images of representative specimens of the species detailed here are available at <www.tropicos.org>.

Conservation status assessment methodology. The study presented here is taxonomic and floristic: the objective is enumeration of the species that belong to various Rubiaceae genera, and the species that occur in

the area of tropical Central and South America. The methods employed here correspond only to this objective; thus, this study is based on survey of specimens collected over a number of years using varied survey methods aimed at various objectives. The specimens here used to delineate the range and commonness of these new species were located through a non-exhaustive survey of several herbaria, and no field studies have been done targeting the occurrence of these species where they are known or expected to grow. Thus, the floristic information presented here is a simplified presence report based on incomplete survey of the available data, which are uneven and incomplete for this region (Schulman et al., 2007). Knowledge of the true geographic range and the population size and dynamics of a species are essential to understanding the threats to its existence, and thus to understanding its actual conservation status; documentation of the existence of a species based on one or several museum collections does not provide adequate data to evaluate these factors. Conservation assessments are provided here for these newly described species using IUCN categories and criteria (IUCN, 2001) based on the totality of our current knowledge. The basis for these assessments in the form of a map and the calculated assessment parameters are available under the corresponding species names at <www.tropicos.org> (assessment parameters for each map can be seen using "Show Detail"). The assessment parameters were calculated using the IUCN Rating tool (Moat, 2007) in ArcView GIS 3.2 (ESRI, 1999), with the grid cell size used for calculating area of occupancy (AOO) varied between 1.00 and 3.16 km depending on characteristics of the species and data (IUCN Standards and Petitions Working Group, 2008). These assessments are not being submitted to IUCN for publication in the Red List (<www.iucnredlist.org>), and the basis for these assessments should be carefully evaluated by the reader.

KEY TO GENERA OF GUETTARDEAE WITH OVULES SOLITARY IN EACH OVARY LOCULE FROM CENTRAL AND SOUTH AMERICA

1a. Inflorescences terminal, or terminal and also produced in uppermost leaf axils; fruits dry, indehiscent or schizocarpous.
  2a. Stipules triangular; fruits samaroid with the body flattened and winged . . . . . *Allenanthus* Standl.
  2b. Stipules triangular, 2-lobed, or 3-lobed; fruits ellipsoid to obovoid, angled or rounded to somewhat flattened, sometimes with samaroid calyx lobes.
    3a. Stipules triangular or 2-lobed; bracts eglandular; fruit schizocarpous, splitting into 2 mericarps, or indehiscent with samaroid calyx lobes that enlarge as fruits develop . . . . . *Machaonia* Bonpl.
    3b. Stipules 3-lobed; bracts of higher-order axes eglandular or usually glandular abaxially at base; fruit indehiscent, with calyx lobes linear and similar in size to calyx lobes in flower . . . . . II. *Neoblakea* Standl.
1b. Inflorescences axillary, borne at nodes below stem apex; fruits fleshy, indehiscent.
  4a. Corolla lobes 4, valvate or valvate-induplicate in bud; leaves with tertiary or higher-order venation not visible or lineolate.
    5a. Erect to scandent subshrubs, shrubs, or lianas, unarmed or with axillary spines; stipules acute; corollas salverform, with well-developed tubes and glabrous in throat . . . . . I. *Chomelia* Jacq.
    5b. Scandent shrubs or lianas, unarmed; stipules acute to rounded; corollas rotate to funnelform and pubescent in throat . . . . . *Malanea* Aubl.
  4b. Corolla lobes 4 or 5, imbricate in bud; leaves with tertiary and/or higher-order venation not visible, lineolate, or regularly to irregularly areolate.
    6a. Leaves with tertiary and/or higher-order venation lineolate; corollas with lobes equal to or longer than tube; anthers exserted on well-developed filaments; pyrenes 2-locular . . . . . III. *Pittoniotis* Griseb.
    6b. Leaves with tertiary and higher-order venation not visible, or if visible then irregularly to rather regularly areolate; corollas with lobes shorter than tube; anthers included or exserted on short filaments; pyrenes 1- to 9-locular.
      7a. Stems at apex and stipules not resinous; pyrenes solid in center . . . . . *Guettarda* L.
      7b. Stems at apex and stipules sparsely to copiously resinous; pyrenes in the center variously solid or with a central locule or space . . . . . IV. *Stenostomum* C. F. Gaertn.

I. *CHOMELIA*

The Neotropical genus *Chomelia* comprises at least 50 species of shrubs, small trees, and lianas found in dry to wet, usually lowland forests and brushlands from central Mexico to Paraguay (Lorence & Taylor, 2001; Taylor et al., 2004). Many *Chomelia* species have distinctive lineolate (i.e., closely set and parallel) tertiary or quaternary venation visible on the abaxial leaf surface; in the remaining species the tertiary venation is sometimes irregularly areolate or sometimes not visible, and the higher-order venation is usually not visible. The corolla lobes of many species of *Chomelia* are marginally irregular and weakly crisped to sometimes elaborately appendaged, similarly to several Rubiaceae genera of various tribes (e.g., *Joosia* H. Karst., *Arachnothryx*). Species of *Chomelia* with elaborately appendaged lobes were previously separated in *Anisomeris* C. Presl, but Steyermark (1967) showed that there is variation in this feature even within species so it does not distinguish two distinct groups of plants, and consequently he combined these genera. Some authors (e.g., Burger & Taylor, 1993) have reported both

valvate and imbricate corolla aestivation in *Chomelia*, but in the current circumscription the species of this genus all appear to have valvate or valvate-induplicate aestivation. Some *Chomelia* species bear paired spines along their stems; this condition has been used to distinguish species, but can be difficult to interpret because individual plants of usually spinescent species sometimes do not produce any spines. Many *Chomelia* species show a characteristic growth form, with internodes of the principal stems regularly developed and the lateral shoots reduced to spur shoots (i.e., brachyblasts). *Chomelia* has not been studied as a whole, although some regional treatments have been published (e.g., Steyermark, 1967, 1974; Taylor et al., 2004). The name *Chomelia* was at one time incorrectly used for some Asian Rubiaceae that are mostly now classified in *Tarenna* Gaertn. and *Aidia* Lour.; this historical error has generated some persistent confusion about the geographic range and morphological characters of *Chomelia*.

1. Chomelia chiquitensis C. M. Taylor, sp. nov. TYPE: Bolivia. Santa Cruz: prov. Chiquitos, Valle de Tucabaca, a 20 km al O de Santo Corazón, tramo entre La Cal y Campamento Los Murciélagos, 18°05′S, 59°03′W or 18°01′30″S, 59°01′50″W [see discussion of coordinates below], 500 m, 24–28 Oct. 1994, *I. G. Vargas C., G. Navarro & H. Justiniano 3547* (holotype, USZ not seen; isotypes, F, MO-05006411, MO-5828914). Figure 1A, B.

Haec species a *Chomelia sericea* Müll. Arg. bracteis linearibus atque corolla breviore distinguitur.

Shrubs to 3 m tall, without spines; stems subterete, hirtellous and/or pilosulose-tomentulose to glabrescent, terminating in clustered nodes, with both well-developed principal stems and short to well-developed lateral stems. *Leaves* usually clustered near ends of stems, elliptic to lanceolate-elliptic, 2–4 × 0.8–2.4 cm, drying papery, adaxially strigillose to sparsely tomentulose, abaxially densely hirtellous-tomentulose or pilosulose-tomentulose, base acute to obtuse, apex acute; secondary veins 4 to 5 pairs, with pubescent domatia in abaxial axils, costa and secondary veins prominulous on both surfaces, tertiary and higher-order venation plane, visible, closely lineolate; *petioles* 1–9 mm, hirtellous; *stipules* generally persistent, triangular to broadly triangular, 2–4 mm, abaxially strigillose to strigose, acute. *Inflorescences* subcapitate to congested-cymose, branched to 1 order, paired in axils at ends of stems, densely pilosulose to hirtellous, with 3 to 11 flowers; peduncle 0.8–2.5 cm; bracts free, linear, 0.8–2 mm. *Flowers* sessile; ovary portion ellipsoid, ca. 1.2 mm, densely pilosulose-hirtellous; *calyx limb* strigose to sericeous, lobed, with tubular portion ca. 0.5 mm, lobes linear, 1–1.5 mm, separated by concave sinuses; *corolla* greenish white, slenderly funnelform, outside moderately to sparsely strigose, tube 9–10 mm, cylindrical, ca. 0.8 mm diam., lobes elliptic, 2.2–2.5 mm, obtuse to rounded, entire, in bud induplicate-valvate, together forming an obtuse bud apex; *anthers* narrowly elliptic-oblong, ca. 2 mm, subsessile, included with apices positioned ca. 1.5 mm below top of corolla tube; *stigmas* 2, linear, ca. 0.8 mm, included on styles ca. 3 mm. *Fruits* not seen.

Habitat, distribution, and phenology. *Chomelia chiquitensis* is known from deciduous, rather dry forest on limestone substrates at ca. 500 m in eastern Bolivia; it has been collected in flower in October.

IUCN Red List category. This species meets the geographic range criterion for Critically Endangered based on the small AOO. It is found within a legally protected area, where continued decline in the habitat is possible, but has not been confirmed; because of the lack of information, this species does not meet the subcriteria for this evaluation. However, the known localities for *Chomelia chiquitensis* are relatively close together, so this species could be threatened by a stochastic event such as fire and it is here evaluated as Vulnerable due to restricted range: VU D2.

Discussion. This new species is distinguished by its relatively small acute leaves with densely hirtellous-tomentulose or pilosulose-tomentulose pubescence on their abaxial surfaces, its subcapitate to congested-cymose inflorescences with three to 11 flowers borne on well-developed peduncles, its linear bracts and calyx lobes, and its corollas with slender, well-developed tubes and entire lobes. The flowers of both of the collections studied are similar and resemble the short-styled form of distylous species of *Chomelia*. This new species is similar to *C. sericea* Müll. Arg. of Bahia in eastern Brazil; *C. sericea* can be distinguished by its ovate bracts 1–1.5 mm wide and its longer corollas (15–18 mm long vs. 11.2–12.5 mm in *C. chiquitensis*). This new species is also similar to *C. kirkbridei* Delprete of northeastern Brazil; *C. kirkbridei* can be separated by its mostly shorter calyx lobes (0.7–1 mm long) and its shorter corolla lobes (1.3–1.7 mm long). *Chomelia chiquitensis* is known only from two collections from the Chiquitos region of eastern Bolivia; the specific epithet refers to this region.

There are two specimens at MO of the type collection, *I. G. Vargas et al. 3547*; the data on the two labels are the same, except two different sets of latitude and longitude coordinates are given. The first set of coordinates cited in the protologue above is

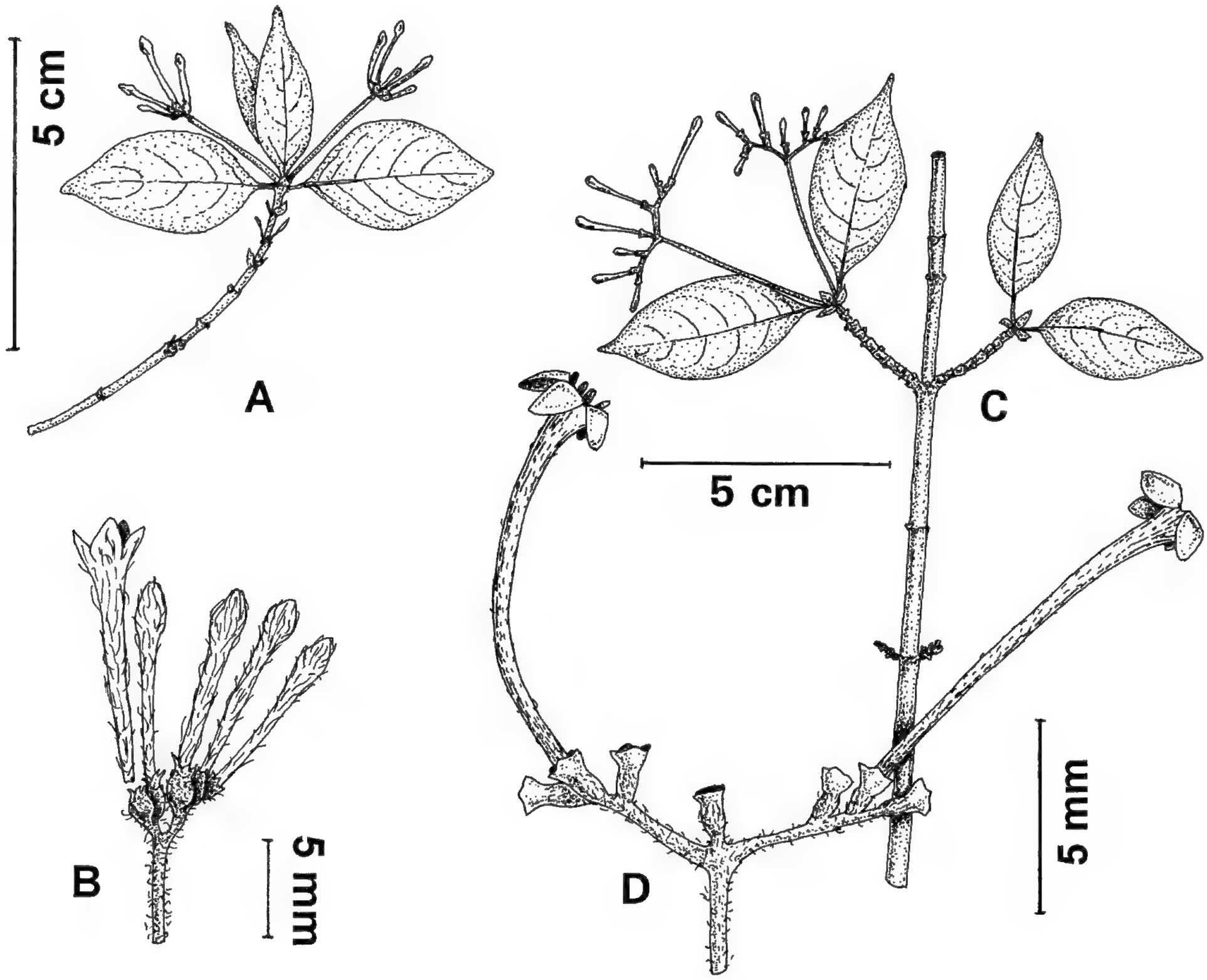

Figure 1. A, B. *Chomelia chiquitensis* C. M. Taylor; based on the type *Vargas et al. 3547* (MO). —A. Flowering branch. —B. Portion of inflorescence with one flower bud near anthesis that is partially opened and four flower buds. C, D. *Chomelia costaricensis* C. M. Taylor; based on the type *Rivera 1376* (INB). —C. Flowering stem. —D. Portion of inflorescence with dichasial axes, two flowers at anthesis, and five flowers from which the corollas have fallen.

found on the label of MO-05006411, while the second set cited above is found on the label of MO-5828914. These two sets of coordinates identify points that are quite close to each other. The reasons for this discrepency and which set of coordinates is more accurate are unknown at this time.

Paratypes. BOLIVIA. **Santa Cruz:** prov. Chiquitos, Valle de Tucabaca, a 20 km al O de Santo Corazón, tramo entre La Cal y Campamento Los Murciélagos, 18°05′S, 59°03′W, *I. G. Vargas C., G. Navarro & H. Justiniano 3565* (F, MO, USZ).

2. Chomelia costaricensis C. M. Taylor, sp. nov. TYPE: Costa Rica. Alajuela: Parque Nac. Rincón de la Vieja, Colonia Blanca, Finca Los Moras, junto a Quebrada Mora, 10°46′N, 85°16′W, 770 m, 13 June 1991, *G. Rivera 1376* (holotype, INB; isotype, MO-6173020). Figure 1C, D.

Haec species a *Chomelia grandicarpa* Dwyer spinis praesentibus, foliis minoribus atque limbo calycino truncato undulatove, a *C. microloba* Donn. Sm. foliis ad axillas abaxiales venarum domatiis carentibus atque tubo corollino valde longiore distinguitur.

Shrubs, height not noted, armed with woody spines 5–10 mm, borne on shoots with developed internodes; stems subquadrangular, strigillose to glabrescent, with both well-developed principal stems and short lateral spur stems. *Leaves* borne on principal stems and spur shoots, elliptic, 2.5–6 × 1–3 cm, drying chartaceous, adaxially glabrous, abaxially glabrous except sparsely strigose to strigillose along costa, apex acute to a little acuminate with ultimate tips then obtuse to rounded, base cuneate to obtuse; secondary veins 5 to 6 pairs, without domatia, higher-order venation not visible; petioles 1–5 mm, strigillose or strigose to glabrous; *stipules* persistent, triangular, 2–4 mm, abaxially strigose then glabrescent, acute. *Inflorescences* cymose, paired at nodes along and at apices of spur shoots, strigillose to glabrescent, ebracteate; peduncle 0.5–3.7 cm; branched portion dichasial at first (i.e., basalmost) node, axes 2, scorpioid, 3–6 mm, each with 2 to 3 flowers. *Flowers* sessile; ovary portion cylindrical, ca. 2 mm, moderately strigillose; *calyx limb* 1–1.2 mm, sparsely strigillose to glabrescent, truncate to undulate or shallowly 4-lobed; *corolla* white or green flushed with red, slenderly salverform,

outside moderately to densely strigillose, inside glabrous, tube 21.5–22 mm, cylindrical, ca. 0.8 mm diam. near middle, lobes elliptic, 2.5–3 mm, obtuse, entire, in bud valvate or thinly valvate-induplicate, together forming an obtuse bud apex; *anthers* narrowly oblong, ca. 3.5 mm, subsessile, partially exserted; *stigmas* 2, linear, 1.2–1.5 mm, included, situated just above middle of corolla tube. *Fruits* not seen.

Habitat, distribution, and phenology. *Chomelia costaricensis* is known from wet forest at ca. 770 m on the eastern slopes of the Cordillera de Guanacaste in northwestern Costa Rica; it has been collected in flower in June.

IUCN Red List category. This species meets the geographic criteria for Critically Endangered based on having only a single known locality. It is found within a legally protected area, where decline in the habitat has not been confirmed, and in an area where very little at all is known of the flora (M. Grayum, pers. comm.). Because of this lack of information, this species does not meet the subcriteria for this evaluation and is here considered Data Deficient: DD.

Discussion. Although *Chomelia costaricensis* is known from only one specimen, this specimen is adequate to document this distinctive new species. The specific epithet refers to its geographic distribution. The flowers seen resemble the short-styled form of distylous *Chomelia* species. This new species is generally similar to *C. microloba* Donn. Sm., which is found in seasonal forests of Costa Rica and Panama; however, *C. microloba* differs from *C. costaricensis* in its shorter corollas, with the tubes 6–8 mm long, and its leaves abaxially with well-developed domatia in the form of tufts of pubescence borne in the axils of the secondary veins. This new species is also similar to *C. grandicarpa* Dwyer of central Panama; however, *C. grandicarpa* differs in its lack of spines, its calyx limbs that are lobed for half their length or more, and its generally larger leaves (4.5–10 × 2.5–5.5 cm). *Chomelia grandicarpa* is notable within the genus for its relatively large fruits (ca. 30 × 22 mm); the fruits of *C. costaricensis* are so far unknown, but may be smaller and thus may also separate these two species.

3. Chomelia torrana C. M. Taylor, sp. nov. TYPE: Colombia. Chocó: mun. San José del Palmar, Cerro del Torrá, vertiente E, mesa abajo de cumbre, 2500–2550 m, 13 Aug. 1988, *P. A. Silverstone-Sopkin, N. Paz, R. T. González, J. E. Ramos, L. H. Ramos & A. Henao 4367* (holotype, CUVC; isotype, MO-4048455). Figure 2C, D.

Haec species a congeneris foliorum venatione ordinis superioris non manifesta, inflorescentia brevi pauciflora, corolla obscure rubroviolacea atque fructu parvo distinguitur.

Shrubs to 2.5 m tall, without spines; stems subquadrangular, glabrous except with dense rings of persistent trichomes, 0.5–1 mm at nodes, with regularly developed internodes. *Leaves* borne along principal stems, elliptic to ovate, 2.5–8.2 × 2–4.2 cm, drying chartaceous, on both surfaces glabrous on lamina and strigillose on margins, costa, and secondary veins, base cuneate to obtuse, apex acute to acuminate with tips 4–10 mm; secondary veins 4 to 9 pairs, without domatia, tertiary and higher-order venation not visible; *petioles* 4–6 mm, strigillose; *stipules* caducous, triangular, 7–12 mm, smooth to costate, abaxially glabrous or strigose near base, acute to acuminate. *Inflorescences* cymose, 1–2 cm, paired at nodes along principal stems, densely and finely strigillose, with 3 to 7 flowers; peduncle 0.4–1 cm; developed axes 1 or 2, scorpioid; bracts triangular, 0.1–0.5 mm, often caducous. *Flowers* sessile; ovary portion cylindrical-ellipsoid, ca. 2 mm, puberulous; *calyx limb* 0.5–0.8 mm, strigillose-puberulous, truncate to undulate; *corolla* dark red-violet on tube and paler on lobes, salverform, outside puberulous-tomentulose, tube 9–9.5 mm, weakly funnelform, ca. 1 mm diam. near middle, lobes triangular, 1.8–2 mm, acute, along margins with 3 ellipsoid to obovate appendages 1–1.5 mm, these with margins crisped to strongly ruffled, in bud valvate or thinly induplicate-valvate, together forming an obtuse bud apex; *anthers* and *stigmas* not seen. *Fruits* ellipsoid, 6–7 × ca. 4 mm, weakly 4-ribbed, black; pyrene ellipsoid, longitudinally 4-ridged, 4-locular.

Habitat, distribution, and phenology. *Chomelia torrana* is known from wet montane forests of the Cerro del Torrá, an outlier of the Western Cordillera of the Andes in northwestern Colombia, at 2500–2550 m; it has been collected in flower and fruit concurrently in January and August (i.e., the months when collecting expeditions visited the area).

IUCN Red List category. This species meets the geographic range criteria for Critically Endangered based on the few known localities and small overall range. It is known from several collections made at different times on a single mountain, which is not within a legally protected area, but is relatively isolated and inaccessible; decline in the habitat here is possible, but has not been confirmed. Because of the lack of demonstrated threat, this species does not meet the subcriteria for this evaluation, but the known range of *Chomelia torrana* is relatively small, so this species could be threatened by a stochastic event such as rapid habit destruction and is here evaluated as Vulnerable due to restricted range: VU D2.

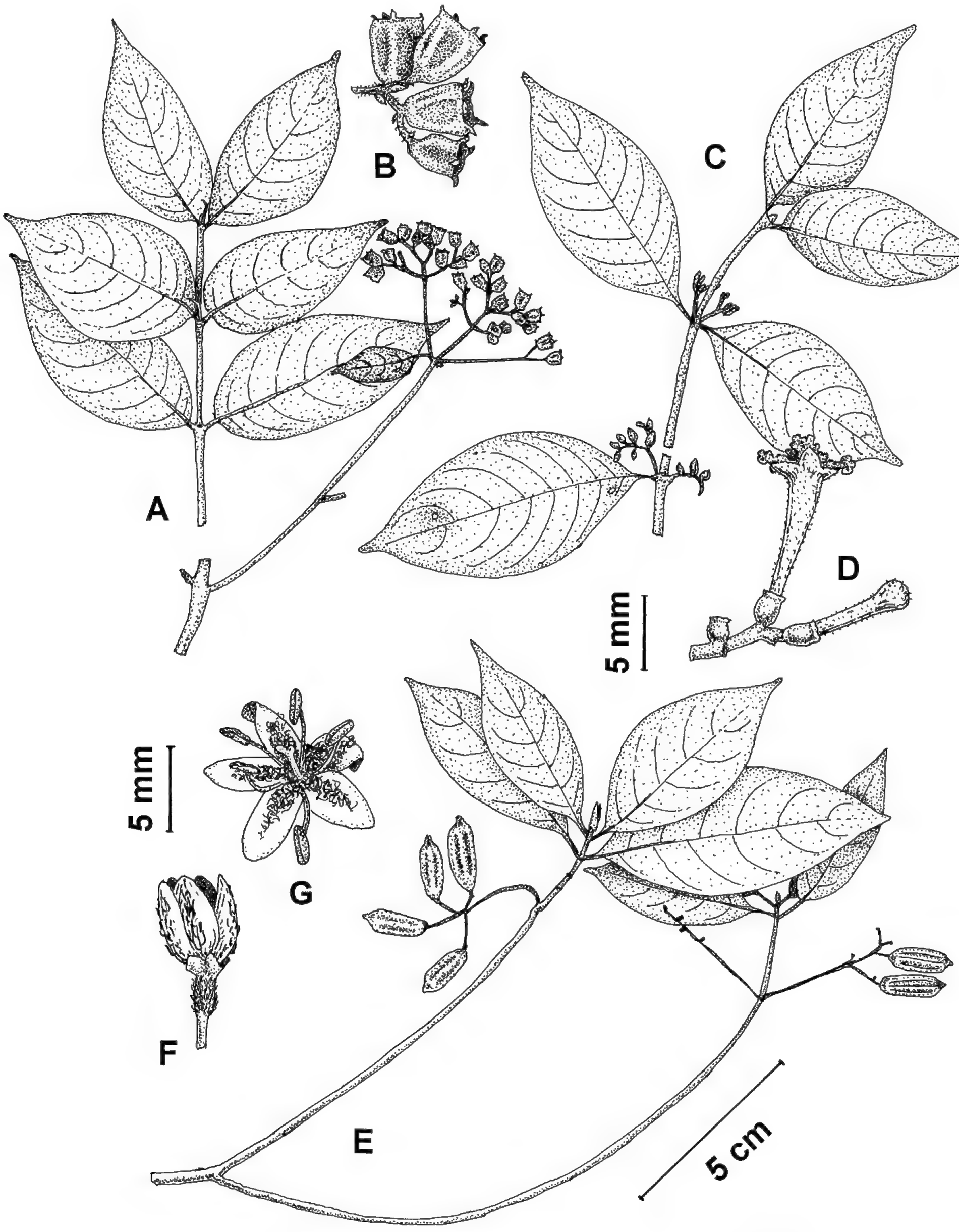

Figure 2. A, B. *Neoblakea ecuadorensis* C. M. Taylor, based on the type *Dodson et al. 13588* (MO). —A. Fruiting stem, divided, with upper leaf-bearing portion and lower nodes bearing infructescence. —B. Portion of inflorescence with four fruits. C, D. *Chomelia torrana* C. M. Taylor. —C. Stem with inflorescences and infructescences; based on the type *Silverstone-Sopkin et al. 4367* (MO). —D. Portion of inflorescence with one flower at anthesis, one flower bud, and one flower from which the corolla has fallen; based on the paratype *Silverstone-Sopkin et al. 4801* (MO). E–G. *Pittoniotis rotata* C. M. Taylor. —E. Fruiting branch; based on the paratype *Monteagudo et al. 4956* (MO). —F. Mature flower bud, starting to open. —G. Flower at anthesis. F, G based on the type *Jaramillo & Zak 8164*. A, C, E to same 5-cm scale; B, D to same 5-mm scale; F, G to same 5-mm scale.

Discussion. This new species resembles several montane species of *Guettarda* in general aspect, but its four valvate to valvate-induplicate corolla lobes indicate its placement in *Chomelia*. Here it is distinguished by its dark red-violet corollas and relatively small fruits. *Chomelia rubra* Lorence & C. M. Taylor of lowland central Panama also has these characters, but this Panamanian species is found at

elevations below 1000 m and differs from *C. torrana* in its leaves with well-developed foveolate domatia in the abaxial vein axils, its mostly shorter stipules (2–3.5 mm long), its sessile or subsessile flowers or cymes, its corollas with longer tubes (15–16 mm long) and entire shorter lobes (ca. 2.5 mm long), and its larger fruits (ca. 15 × 6 mm). The internal details of the flowers are not described here, because available material of this new species is limited and the remote locality from which it is known is unlikely to be explored botanically again soon. Therefore, the very few flowers available have not been dissected.

The area from which *Chomelia torrana* is known, the Cerro del Torrá (Silverstone-Sopkin & Ramos-Pérez, 1995), is a partially isolated mountain from which several other apparently endemic Rubiaceae species are also known (e.g., *Palicourea sopkinii* C. M. Taylor). Its flora is closely related to that of the main Andean mountains and some unusual species are also known from both of these areas (e.g., *Notopleura biloba* C. M. Taylor), and other species are expected to eventually be found in both places as discussed by Silverstone-Sopkin and Ramos-Pérez.

Paratypes. COLOMBIA. **Chocó:** mpio. San José del Palmar, Cerro del Torrá, vertiente E a NE, plan o mesa abajo de la cumbre, *P. A. Silverstone-Sopkin, N. Paz, A. Duque & H. Bayden 1775* (CUVC, MO), *P. A. Silverstone-Sopkin, N. Paz, R. T. González, J. E. Ramos, L. H. Ramos & A. Henao 4449* (CUVC, MO), *4576* (CUVC, MO), *4801* (CUVC, MO).

II. *Neoblakea*

This genus has been treated since its description (Standley, 1930) as including a single species, *Neoblakea venezuelensis* Standl., found at relatively low elevations (0–600 m) in north-central Venezuela (Steyermark, 1974). Its small 3-lobed stipules and small, obconic, corky-woody fruits are unusual within the Rubiaceae and therefore distinctive. The discovery of a second species of this genus with a disjunct distribution in northwestern Ecuador is notable, but probably not unique; both of these areas are not yet well explored botanically.

In his original description, Standley (1930) considered *Neoblakea* not closely related to any other genus then known. He classified it in the Guettardeae based on its general similarity to *Machaonia*, although he considered these genera not closely related based on their different fruits (dry schizocarps or indehiscent samaras in *Machaonia*; see also the Key to Genera, above, for a contrast of the fruits of these two genera). These genera have not been compared since. With additional species and morphological variation now documented in *Machaonia* and more material available of *Neoblakea*, their relationship may deserve reevaluation.

1. Neoblakea ecuadorensis C. M. Taylor, sp. nov. TYPE: Ecuador. Guayas: rd. to Clina de Las Iguanas W of Guayaquil–Duale rd. at Km 19, due W of Pasquales, 70 m, 20 Jan. 1983, *C. H. Dodson, P. M. Dodson, F. M. Valverde, G. Tazan & P. de Velez 13588* (holotype, MO-3023207; isotype, SEL-047785). Figure 2A, B.

Haec species a *Neoblakea venezuelensi* Standl. fructu majore atque foliis ad basim late obtusis vel rotundatis distinguitur.

Small trees to 3 m tall; stems weakly flattened to subterete, glabrescent, sometimes lenticellate. *Leaves* elliptic to elliptic-ovate, 3.5–8 × 2–4 cm, drying papery to stiffly papery, adaxially glabrous, abaxially glabrous except strigillose on costa, secondary veins, and margins, base broadly obtuse to rounded, apex acute to acuminate with tips to 10 mm; secondary veins 8 to 9 pairs, higher-order venation visible abaxially, closely densely areolate; *petioles* 2–4 mm, hirtellous in lines; *stipules* deciduous, interpetiolar, 1.5–2.2 mm, glabrous, deeply 3-lobed with central lobe longest, lobes linear to narrowly triangular. *Inflorescences* and *flowers* not seen. *Infructescences* cymose-corymbose, terminal on relatively short lateral branches, branched to 2 to 3 orders, with 11 to 50 fruits, pilosulose to puberulous sometimes in lines; peduncle 0.5–4 cm; branched portion 1–3 × 2–7 cm; bracts narrowly triangular to narrowly lanceolate, 1–2 mm, acute to acuminate, those borne on higher-order axes often with a deciduous ellipsoid gland ca. 0.1 mm at each side of base. *Fruits* sessile, perhaps immature, obovoid to obconic, to 5 × 4 mm, 3-locular, puberulous to hirtellous, weakly flattened to quadrangular with 4 broadly rounded ridges or corners, woody-corky, base rounded to subtruncate, top flattened with persistent calyx limb lobed nearly to base, lobes triangular, 0.8–1.2 mm, acute to acuminate.

Habitat, distribution, and phenology. *Neoblakea ecuadorensis* is known from seasonal forest at ca. 70 m in western Ecuador; it has been collected in fruit in January.

IUCN Red List category. This species meets the criteria for Critically Endangered based on its documentation from a single known locality. It is found outside of any legally protected area in a region of very advanced and continuing habitat degradation, and is here evaluated as Critically Endangered due to its restricted AOO, lack of re-collection, and highly threatened habitat: CR B2ab(iii).

Discussion. Although only one collection of this new species has been seen, the characters of *Neoblakea* and several features of *N. ecuadorensis* are distinctive. This new species is distinguished within *Neoblakea* by its larger fruits together with its leaves that are broadly obtuse to rounded at the base and have densely finely areolate venation visible on the abaxial surface. In contrast, *N. venezuelensis* has generally smaller, broader fruits (2–4 × 3–5 mm) and leaves that are acute to cuneate at the base and have the tertiary and higher-order venation not or only intermittently visible on the abaxial surface. This new species represents a significant expansion of the range of this genus, into Ecuador; the specific epithet refers to this distribution.

III. *Pittoniotis*

This Neotropical genus has been treated by recent authors (e.g., Steyermark, 1974) to include a single species, *Pittoniotis trichantha* Griseb., that is distinct from other Neotropical genera of Guettardeae in the combination of its leaves with the higher-order venation lineolate, its subrotate corollas with the five lobes imbricated in bud and as long as or longer than the reduced corolla tube, and its drupaceous fruits each with one ridged, 2-locular pyrene. Some recent authors have included *Pittoniotis* in *Antirhea* (e.g., Dwyer, 1980), but subsequent authors (Chaw & Darwin, 1992; Achille et al., 2006) have demonstrated these to be better separated. A second Neotropical species has sometimes been included in *Pittoniotis* also, *P. protracta* (Bartl. ex DC.) Griseb., but this latter species differs from *P. trichantha* and matches *Chomelia* in its corollas with four valvate-induplicate lobes that are significantly shorter than the corolla tube, and accordingly this latter species has been treated by most recent authors as *C. protracta* (Bartl. ex DC.) Standl. (e.g., Standley & Williams, 1974).

The unusual new species described below is provisionally included in *Pittoniotis*. Its addition gives *Pittoniotis* a broader range of corolla form and pubescence and a markedly larger range of fruit size and habitat than it previously included, but this new range of variation is comparable to that found within related genera.

1. Pittoniotis rotata C. M. Taylor, sp. nov. TYPE: Ecuador. Pichincha: Reserva Flor.-Ecol. Río Guajalito, a 3.5 km al NE del Km 59 de la carr. antigua Quito–Santo Domingo de los Colorados, estribaciones occidentales del Volcán Pichincha, 00°14′S, 78°48′W, 1800–2200 m, 27 Aug. 1985, *J. Jaramillo & V. Zak 8164* (holotype, QCA; isotype, MO-6173019). Figure 2E–G.

Haec species a *Pittoniotide trichantha* Griseb. corollae tubo breviore latioreque lobis adaxialiter pubescentibus atque fructu majore distinguitur.

Trees to 20 m tall; stems flattened, densely sericeous to glabrescent except densely pilose at nodes with ascending persistent trichomes to 1.5 mm, prolonged then terminating in clustered nodes, then with growth continuing from a lower node. *Leaves* clustered near stem apices, narrowly elliptic to oblanceolate, 5–10 × 1.2–3 cm, drying papery to stiffly papery, adaxially moderately to sparsely strigose to sericeous, abaxially densely and finely sericeous on lamina and strigose on principal veins, base acute, apex acute to weakly acuminate; secondary veins 7 to 9 pairs, with densely tomentulose or pilosulose domatia, adaxially with venation plane, with quaternary venation evident and closely lineolate, abaxially with costa and secondary veins prominulous, and remaining venation plane and mostly not visible; *petioles* 6–12 mm, strigillose to strigose-hirtellous; *stipules* deciduous, triangular, 4–7 mm, abaxially strigose except glabrous near margins, acute to acuminate. *Inflorescences* cymose-corymbose, paired in axils near stem apices, branched to 2 to 3 orders, strigillose-hirtellous; peduncle 2–3.6 cm, branched portion 1.5–2.5 × 2–4 cm; axes weakly scorpioid, with 2 to 4 flowers; bracts subtending axes narrowly triangular to linear, 0.8–3 mm. *Flowers* sessile, ebracteolate; ovary portion cylindrical, 1.5–2 mm, densely sericeous; *calyx* limb funnelform, 1–1.2 mm, lobed for 1/3–1/2, sparsely strigillose to glabrescent, lobes obtuse to acute; *corolla* white, rotate, outside strigillose; tube funnelform, ca. 1 mm; lobes elliptic-obovate, ca. 4 mm, adaxially densely villosulous in lower and central part, rounded; stamens exserted, filaments ca. 1.8 mm, glabrous, inserted at top of corolla tube, anthers basifixed, narrowly elliptic, ca. 1.5 mm; stigmas ca. 0.3 mm, subcapitate, exserted on styles ca. 3 mm. *Fruits* ellipsoid to obovoid, 2–2.5 × 0.8–1 cm, glabrescent, mature color unknown; pyrene 1, 2-celled, laterally somewhat flattened, with ca. 3 rounded ridges grouped on each of main sides.

Habitat, distribution, and phenology. Pittoniotis rotata is known from cloud forests at 1800–2200 m in north-central Ecuador, where it has been collected in flower in August and in fruit in March, and from wet premontane forests at 1020–1320 m in Peru, where it has been collected in fruit in April and June.

IUCN Red List category. This species meets the geographic range criterion for Critically Endangered based on its restricted AOO. It is not found within a legally protected area, and is known from only two widely separated sites that were explored a decade

apart and lie in a region and vegetation zone that are not well known floristically and have not been confirmed to have a continuing habitat decline. *Pittoniotis rotata* may be difficult to detect due to its habit as a rather large tree and its apparently infrequent local occurrence, as suggested by the very few collections made in the site in Oxapampa, Peru, where the botanical inventory work was intensive; or this may be a species with a low density across a broad range. Due to this lack of information it is here evaluated as Data Deficient: DD.

Discussion. This new species is distinguished by its rotate corollas with relatively short tubes and well-developed lobes that are pubescent with villous trichomes internally and by its relatively large fruits. Additionally, its stem nodes with a dense ring of well-developed persistent trichomes and the rather narrow leaves with ascending secondary veins and silky pubescence on the adaxial surface are distinctive. The other species of this genus, *Pittoniotis trichantha*, is found in lowland, generally seasonal vegetation in the southern and western Caribbean region and can be separated from *P. rotata* by its shortly funnelform corollas that are glabrous internally and have a longer tube (1.5–2 mm long) and shorter lobes (2–3 mm long), its inflorescences with usually well-developed, many-flowered axes, and its smaller fruits (5–6 × 2–3.5 mm). The fruiting specimens from Peru cited below are included here even though no flowers have been seen; no vegetative or fruiting differences are otherwise evident between these and the Ecuadorian specimens.

Paratypes. ECUADOR. **Pichincha:** Reserva Flor.-Ecol. Río Guajalito, a 3.5 km al NE del Km 59 de la carr. antiqua Quito–Santo Domingo de los Colorados, estribaciones occidentales del Volcán Pichincha, *V. Zak 1791* (MO, QCA). PERU. **Pasco:** prov. Oxapampa, distr. Pozuzo, Parque Nac. Yanachaga Chemillén carr. ca. a la Quebrada Misho, *A. Monteagudo, C. Mateo, G. Ortiz & R. Francis 4956* (HOXA, HUT, MO, USM), *A. Monteagudo, G. Ortiz & R. Francis 5006* (HOXA, HUT, MO, USM).

IV. *Stenostomum*

The genus *Stenostomum* in recent circumscriptions comprises several Neotropical species of shrubs and trees found in dry to wet forests of the Antilles, Mexico, and Central America (Moynihan & Watson, 2001; Achille et al., 2006). It is characterized by its resinous young growth, its leaves with the tertiary veins either not visible or arranged in generally regular rectangular areoles, its axillary inflorescences, its perfect flowers, its 4- to 5-lobed calyx limbs, its slender tubular to salverform corollas with the four to five lobes imbricate in bud, its "three-colpate" pollen (Chaw & Darwin, 1992; presumably 3-colporate), and its drupaceous fruits with a single, bony, 2- to 10-locular pyrene. Many *Stenostomum* species have distinctive scorpioid cymes, and the flowers are apparently usually distylous although not all species have been surveyed. *Stenostomum* was previously included in *Antirhea* when the latter was considered a pantropical genus, but Chaw and Darwin (1992) and Achille et al. (2006) showed that the hermaphroditic Neotropical plants are better separated from the dioecious Paleotropical plants with their inaperturate or 1-porate pollen (Chaw & Darwin, 1992). The Paleotropical plants remain in *Antirhea*, while the Neotropical plants have been included variously in *Neolaugeria* Nicolson, *Stenostomum*, and *Pittoniotis*. The results of Achille et al. (2006) suggested that *Stenostomum* is indeed distinct from *Guettarda* and also probably polyphyletic, with the shrubby Caribbean plants not closely related to the arborescent species of the Antilles and Central America; this latter group includes the type species of the genus. However, their results are not well supported, and they did not explicitly separate these groups taxonomically. The species transferred to *Stenostomum* here appear to be more closely related to the group of species that includes the type of this genus than to *Guettarda*, and accordingly are included here. The species of *Stenostomum* have not been studied as a whole in either the restricted or broad circumscription of the genus. *Stenostomum* is similar to *Guettarda*, which can be separated by its young growth that is not resinous; to *Pittoniotis*, which can be separated by its closely lineolate leaf venation, corollas with the tubes shorter than the lobes, and exserted anthers; to *Chomelia*, which can be separated by its valvate or valvate-induplicate corolla lobes and its tertiary and higher-order leaf venation that is either regularly lineolate or not visible; and to *Machaonia*, which can be separated by its dry schizocarpous or indehiscent fruits and its ovaries that are typically a little compressed instead of rounded.

1. Stenostomum acreanum (K. Krause) C. M. Taylor, comb. nov. Basionym: *Guettarda acreana* K. Krause, Notizbl. Bot. Gart. Berlin-Dahlem 6: 204. 1914. TYPE: Brazil. Acre: Alto Acre bei San Francisco, Sep. 1911, *E. Ule 9709* (holotype, B destroyed, photo [F neg. 388] MO).

Discussion. This species has been classified in *Guettarda*, but is unusual morphologically there, in particular in the combination of its little-branched, markedly scorpioid cymes, its sparsely resinous stipules, and its smooth, obovoid pyrenes that at least sometimes have five to six cells arranged in a circle

around a central space or cavity (e.g., *Strudwick et al. 3314*, Brazil [MO, NY]). This species has been suggested by several authors to be most closely related to species now included in *Stenostomum* (Bremekamp, 1959; Taylor et al., 2004), and this proposed relationship was weakly supported by the results of Achille et al. (2006). Accordingly, this species is here transferred to *Stenostomum*. It is known from Costa Rica through the Guianas, Peru, and western Brazil; a morphological description and additional nomenclatural synonymy were presented by Taylor et al. (2004).

There appears to be variation in fruit morphology within this widespread species, with the pyrenes variously multilocular, 3-locular without a central cavity (Bremekamp, 1959; as *Antirhea surinamensis* Bremek.), or 2-locular without a central cavity (Dwyer, 1980; as *Chomelia panamensis* (Standl.) Dwyer). Thus, the taxonomy of *Stenostomum acreanum* as currently circumscribed is in need of further study. Because of this lack of taxonomic knowledge, the conservation status of this species is not assessed here nor is the name *Guettarda acreana* lectotypified (or neotypified) yet.

2. Stenostomum darienense (Dwyer) C. M. Taylor, comb. nov. Basionym: *Chione darienensis* Dwyer, Ann. Missouri Bot. Gard. 67: 94. 1980. TYPE: Panama. Darién: Río Balsa, betw. Manene & Tusijunda, 26 July 1967, *J. A. Duke 13571* (holotype, MO-1968196; isotypes, MO-1956611, MO-2187000).

Discussion. Dwyer (1980) classified a single fruiting specimen from eastern Panama in *Chione* DC., no doubt based on its interpetiolar triangular stipules and its rather large, ellipsoid, apparently drupaceous fruits with what he interpreted to be an immature, single, 7-locular pyrene. However, his plant differs from *Chione* in its stipules that are arranged with one margin of each overlapping the other stipule ("imbricated") in bud rather than with the margins meeting along their edges ("valvate," as in *Chione*) and in its axillary inflorescences with the axes strongly scorpioid rather than the terminal dichasial inflorescences of *Chione*. Additionally, the fruit of Dwyer's plant actually has seven locules that are individually stiffly indurated, rather than fused into a single bony structure, and these locules or cavities are arranged with one centrally placed and the others regularly spaced around it. This species thus cannot be included in *Chione* and was formally excluded from this genus by Taylor (2003), who suggested its affinities might be with *Guettarda*. *Chione darienensis* does agree with *Guettarda* in most features, but differs from *Guettarda* in its resinous stem apices and the arrangement of its fruit locules, peripherally around a central locule or cavity. It also differs in the stiff and apparently free walls of these locules, but as noted by Dwyer, this fruit appears to be immature. This peripheral locule arrangement is found in species of *Stenostomum*, as are resinous stem apices; additionally the immature fruits of some species of *Stenostomum* have stiff-walled individual locules that are rather easily separated. Consequently, *C. darienensis* is here transferred to *Stenostomum*.

IUCN Red List category. *Stenostomum darienense* meets the geographic range criterion for Critically Endangered based on its restricted AOO. It is found within one legally protected area and is known from only two widely separated sites that were explored a decade apart and lie in a region of continuing habitat decline, including in some protected areas. However, this region is not at all well known floristically, and whether this species is restricted to these two sites or distributed continuously between them is unknown. Due to this lack of information, it is here evaluated as Data Deficient: DD.

Additional specimen studied. COLOMBIA. **Chocó:** mpio. Bahía Solano, correg. El Valle, orilla de la carr. entre El Valle y el puente sobre la quebrada Tundó, *J. Espina 2931* (CHOCO, MO).

3. Stenostomum turrialbanum (N. Zamora & Poveda) C. M. Taylor, comb. nov. Basionym: *Guettarda turrialbana* N. Zamora & Poveda, Ann. Missouri Bot. Gard. 75: 1157, fig. 1. 1988. TYPE: Costa Rica. Cartago: bosque Los Espabeles, CATIE, Turrialba, 600 m, 26 June 1986, *N. Zamora, M. M. Chavarría & H. Gómez 1263* (holotype, CR; isotypes, F, MO-3477655).

Discussion. This species differs from *Guettarda* in its markedly resinous stem apices and the arrangement of the ovary locules, which are peripheral around a central space or cavity. This species agrees with *Stenostomum* in these features, and consequently is here transferred to this latter genus.

IUCN Red List category. This species meets the geographic range criteria for Endangered, based on its few known localities and relatively small range (additional specimens included in the analysis are databased in <www.tropicos.org>). It is found within one legally protected area and is known from several separated sites found in a region and vegetation zone that are incompletely known floristically and that have not all been confirmed to have a continuing habitat decline; thus, it fails to fulfill the required subcriteria for this evaluation. However, *Stenostomum turrialba-*

num is apparently fragmented in its distribution, so the species could be threatened by stochastic events such as rapid habitat destruction, and is here evaluated as Vulnerable due to restricted range: VU D2.

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Styloceras connatum (Buxaceae), una Nueva Especie de Bolivia

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Resumen. Una nueva especie del género *Styloceras* Kunth ex A. Juss. (Buxaceae), fue encontrada en los bosques nublados del Parque Nacional Madidi y la Reserva Biosfera y Tierra Comunitaria de Origen Pilón Lajas en los Andes Bolivianos. Se describe e ilustra a *S. connatum* Torrez & P. Jørg., taxón que presenta similitudes morfológicas con *S. penninervium* A. H. Gentry & Aymard, pero se distingue de está por la consistencia de las hojas, número de anteras, color de flores y las características del fruto. Se proporciona una clave para la identificación de especies de *Styloceras* conocidas al presente.

Abstract. A new species of the genus *Styloceras* Kunth ex A. Juss. (Buxaceae) was collected in the cloud forests of Madidi National Park and Pilón Lajas Biosphere Reserve and Communal Lands in the Bolivian Andes. We describe and illustrate *S. connatum* Torrez & P. Jørg., a taxon that has morphological similarities with *S. penninervium* A. H. Gentry & Aymard, but can be distinguished by the consistency of the leaves, numbers of anthers, flower color, and the characteristics of the fruit. A key to the species of *Styloceras* is provided.

Key words: Bolivia, Buxaceae, IUCN Red List, Madidi National Park, Pilón Lajas Biosphere Reserve and Communal Lands, *Styloceras*.

Buxaceae es una familia muy relacionada con Didymelaceae y Haptanthaceae que en su conjunto forman Buxales, un orden basal en las eudicotiledoneas (Balthazar et al., 2000; Stevens, 2001 onward; Balthazar & Endress, 2002a, b). El género *Styloceras* Kunth ex A. Juss. fue descrito en 1824, a partir de dos colectas de América ecuatorial de A. von Humboldt y A. Bonpland (Baillon, 1859). El género se diferencia de los otros dos géneros neotropicales (*Buxus* L. y *Sarcococca* Lindl.) de la familia por la ausencia de tépalos y por poseer estambres numerosos (vs. tépalos presentes y estambres por lo general cuatro) (Köhler, 2007).

Cuatro especies fueron descritas antes de 1869 (no incluyendo *Styloceras dombeyanum* Baill. un nombre nudum), en 1981 y 1993 se agregaron dos especies (Gentry & Foster, 1981; Gentry & Aymard, 1993) y ahora se describe una especie adicional para el género. Las seis especies reconocidas hasta el presente, no incluyen *S. macrostachyum* Poepp. ex Baill. especie excluida por Baillon (1859), actualmente es sinónimo de *Aparisthmium cordatum* Baill. (Euphorbiaceae) (Secco, 2004). Las especies de *Styloceras* están distribuidas en America del Sur, específicamente en los países de Venezuela, Colombia, Ecuador, Perú y Bolivia. Son especies de las faldas de los Andes, a excepción de *S. brokawii* A. H. Gentry & R. B. Foster que se encuentra en bosques tropicales de tierras bajas (Gentry & Foster, 1981). La actual distribución del género nos indicaría que *Styloceras* emigró a las tierras altas andinas durante las glaciaciones del Pleistoceno. Estos cambios climatológicos causaron drásticos cambios en la vegetación, especialmente en la base de las cadenas montañosas neotropicales (Hooghiemstra et al., 2002, 2006; Hooghiemstra & Hammen, 2004; Antonelli et al., 2009).

Styloceras connatum Torrez & P. Jørg., sp. nov.
TIPO: Bolivia. La Paz: Abel Iturralde, Parque Nac. Madidi, comun. Mamacona sobre el camino de Apolo hacia San José de Uchupiamonas, 14°28′17″S, 68°11′35″W, 1532 m, 11 ago. 2002 (♂ fl.), *C. Maldonado, R. Seidel, H. Cabrera, M. Seidel, H. Pariamo, M. Villanueva, R. Alvarez y J. Tito 2772* (holotipo, LPB; isotipos, BOLV, CTES, HSB, MA, MO, USZ). Figura 1.

Haec species a *Stylocerate brokawii* A. H. Gentry & R. B. Foster, *S. laurifolio* (Willd.) Kunth, *S. kunthiano* A. Juss. et *S. columnari* Müll. Arg. foliis penninerviis, a *S. penninervio* A. H. Gentry & Aymard foliis ellipticis membranaceis subcoriaceisve apice acuminatis, inflorescentiae rhachide graciliore, floribus alboviridulis atque stylis in fructu e base per 0.7 mm connatis differt.

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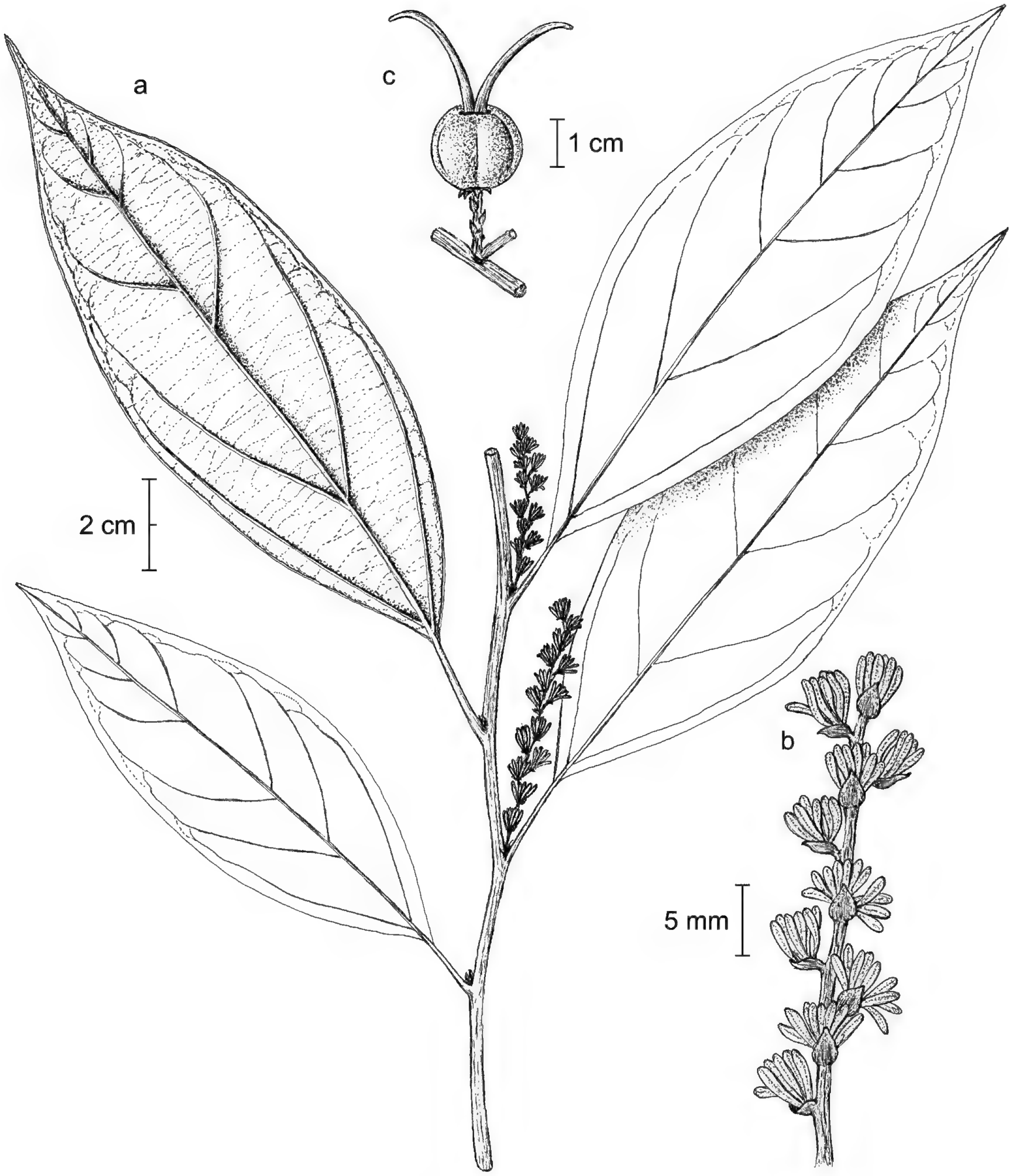

Figura 1. *Styloceras connatum* Torrez & P. Jørg. —A. Rama con inflorescencias. —B. Inflorescencia. —C. Fruto. Ilustrado por Carlos Maldonado. A, B fueron dibujados del tipo *C. Maldonado et al. 2772* (LPB); C fue dibujado del paratipo *C. Maldonado et al. 2688* (LPB).

Planta dioica, arbusto o árbol de 1–8 m de alto, hasta 8.8 cm DAP, con ramas glabras y estriadas. Pecíolos de 1–2.5 × 0.12–0.2 cm, acanalados, glabros; lámina 8.5–17.2 × 2.9–7.2 cm, elíptica, semicoriácea, glabra, margen entero, revoluto, ápice acuminado, base cuneada; nervación pinnada, nervio principal ligeramente prominente en el envés e impreso en el haz, venación secundaria ligeramente prominente en el envés y plana en el haz, venación terciaria ligeramente visible, plana en el haz como en el envés. Inflorescencia masculina 1, raramente 2 a 3, espiga axilar(es), 7 a 29 flores; raquis 1.5–9 cm, glabro, estriado; inflorescencia femenina desconocida. Flores masculinas subsésiles, flores masculinas subtendidas por brácteas, 2–4 × 1.1–2.5 mm, deltoide-ovadas, ápice agudo, margen entero; anteras 8 a 19, sésiles, 1.5–2.6 mm; flores femeninas desconocidas. Fruto con pedicelo 0.5–1.5 cm, glabro; brácteas 7 a

12, 0.6–1.3 × 0.33–0.75 mm; cáliz persistente, sépalos 5, libres, 1.1–1.2 mm, deltoide-agudos; fruto globoso, 1.5–2 cm de diám. aprox. (posiblemente inmaduro); estilos 2, 2–2.6 cm, persistentes, erectos, glabros, estriados, ápice curvado y aguzado, con hendidura media, margen revoluto, fusionados aprox. 0.7–1 mm en la base.

Distribución y habitat. Al presente, *Styloceras connatum* es solamente conocida en el Parque Nacional Madidi y la Reserva Biosfera y Tierra Comunitaria de Origen Pilón Lajas en los Andes Bolivianos, en bosques montanos pluviales y bosques húmedos tropicales desde 560 a 1650 m.

Categoria de la Lista Roja de UICN. Consideramos pertinente ubicarla dentro de la categoría de Preocupación Menor (LC, sigla en inglés) de la UICN (UICN, 2001). Debido a que se conoce cuatro colectas de tres sitios de estudio distintos en provincia Abel Iturralde, departamento de La Paz, y en provincia José Ballivián, departamento del Beni, Bolivia.

Fenología. La especie nueva florece en abril, junio y agosto y tiene frutos en agosto.

Etimología. El epíteto específico se refiere a la conexión basal de los estilos persistentes.

Discusión. Las características de *Styloceras connatum* que la diferencian de *S. penninervium* A. H. Gentry & Aymard, se encuentran en las hojas, inflorescencias y frutos. La consistencia de las hojas de *S. connatum* es semicoriácea y son visiblemente más delgadas que las hojas de *S. penninervium*. *Styloceras penninervium* presenta hojas con ápice agudo (Gentry & Aymard, 1993), en cambio en *S. connatum* es acuminado. *Styloceras penninervium* presenta 1 a 3 fascículos de inflorescencias axilares (Gentry & Aymard, 1993) al igual que *S. connatum*, únicamente se diferencian por el número de anteras y el tamaño de estos, ya que *S. penninervium* tiene 12 a 17 anteras que miden de 2–2.6 mm, en cambio *S. connatum* presenta 8 a 19 anteras que miden 1.5–2.6 mm. El raquis de las inflorescencias es más grueso y robusto en *S. penninervium*. Además, *S. penninervium* presenta flores verde-amarillo pálidas y *S. connatum* posee flores blanco-verduscas. Los estilos persistentes en *S. connatum* nacen del mismo punto y están unidos en la base, mientras que en *S. penninervium* se encuentran separados por 1 cm (Gentry & Aymard, 1993).

En estado estéril *Styloceras connatum* y *S. brokawii* son muy similares, es muy difícil y casi imposible distinguirlas sólo por sus características vegetativas. Pero en estado fértil, las características reproductivas que las diferencian son el tamaño de las anteras y el fruto. *Styloceras connatum* presenta anteras de mayor tamaño (1.5–2.6 mm) que *S. brokawii* (1–1.5 mm). Otro aspecto que la diferencia de esta especie son las características del fruto, *S. connatum* tiene la base de los estilos fusionada, en cambio *S. brokawii* tiene los estilos separados desde la base.

Paratipos. BOLIVIA. **Beni:** General José Ballivián: lower slopes of Serrania Pilón Lajas, 14.3 km N of the bridge over the Río Quiquibey, 700 m, 15°19′S, 067°03′W, 10 June 1985 (♂ fl.), *J. C. Solomon 13947* (MO). **La Paz:** Abel Iturralde, Parque Nac. Madidi, comun. Mamacona sobre el camino de Apolo a San José de Uchupiamonas, a 1 km subiendo el río Mamacona, 1626 m, 14°27′02″S, 68°11′47″, 9 ago. 2002 (fr.), *C. Maldonado, R. Seidel, H. Cabrera, H. Pariamo, R. Alvarez y J. Tito 2688* (LPB, MO); Parque Nac. Madidi, región de Tumupasa, 560 m, 14°12′28″S, 067°56′56″W, 28 abr. 2001 (♂ fl.), *M. J. Macia, J. Quisbert, S. Chao, C. Marupa y S. Medina 3993* (LPB, MA, MO).

A continuación presentamos una actualización de la clave de especies de Gentry y Aymard (1993), incluyendo la nueva especie *Styloceras connatum*. La terminología de la nervación usada por Gentry y Aymard (1993) la hemos tratado de precisar debido a que casi todas las especies son penninervadas y con tres nervios que salen de la base, la diferencia depende de lo pronunciado que sea el margen revoluto en la base y eso varia entre hojas de la misma muestra. De todos modos, el género *Styloceras* presenta dos diferentes tipos de nervación que divide el género morfológicamente. Un grupo posee la nervación principal y secundaria muy marcada tanto en el haz, como en el envés. Las especies que tienen este tipo de nervación son *S. columnare* Müll. Arg., *S. kunthianum* A. Juss. y *S. laurifolium* (Willd.) Kunth. El otro grupo esta compuesto por *S. brokawii*, *S. penninervium* y *S. connatum*, que presentan nervación mucho menos prominente y casi plana en ambas superficies.

Clave para las Especies de *Styloceras*

1a. Hojas con nervación poco prominente, casi plana y no muy elevada ni hundida en el haz o envés.
  2a. Hojas coriáceas; anteras 12 a 17 por flor masculina, 2–2.6 mm de largo; fruto con dos estilos separados por 1 cm . . . . *S. penninervium*
  2b. Hojas papiráceas a semicoriáceas; anteras 8 a 19 por flor masculina, 1–2.6 mm de largo; fruto con dos estilos naciendo del mismo punto o separados por 7 mm.
    3a. Hojas semicoriáceas; anteras 8 a 19 por flor masculina, 1.5–2.6 mm; frutos con estilos naciendo del mismo punto y unidos en la base por 0.7–1 mm . . . . . *S. connatum*
    3b. Hojas papiráceas a membranáceas; ca. 14 anteras por flor masculina, anteras 1–1.5 mm de largo; fruto con estilos separados por hasta 7 mm . . . . *S. brokawii*

1b. Hojas con nervios hundidos en el haz y muy prominentes en el envés.
4a. Inflorescencia monoica, con flores femeninas apicales; anteras de 3 mm de largo . . . . . *S. kunthianum*
4b. Inflorescencia dioica, ocasionalmente con una flor femenina en la base de las inflorescencias masculinas.
5a. Base de los estilos fusionados en el fruto o saliendo del mismo punto; nervios terciarios prominentes en el envés; anteras ca. 2 mm de largo; fruto 1.5–3 cm de diám. . . . . *S. columnare*
5b. Base de los estilos separados por más de 3 mm; nervios terciarios casi planos en el envés; anteras 1.5–3 mm de largo; fruto 1.5–2 cm de diám . . . . *S. laurifolium*

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A New Species of *Heterostemma* (Apocynaceae, Asclepiadoideae) from Vietnam

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ABSTRACT. A new species in Apocynaceae, *Heterostemma xuansonense* T. B. Tran & Joo-Hwan Kim, is described from Vietnam; illustrations and a comparison with related species are also provided. *Heterostemma xuansonense* distinctly differs from *H. grandiflorum* Costantin by the flower color, the absence of a peduncle, and the size of the corona.

Key words: Apocynaceae, Asclepiadoideae, *Heterostemma*, IUCN Red List, Phu Tho, Vietnam.

The genus *Heterostemma* Wight & Arn. comprises approximately 30 species and is widely distributed in Burma (Myanmar), China, India, Indonesia, Laos, Malaysia, Nepal, New Guinea, the Philippines, Sri Lanka, Thailand, Vietnam, and Australia (Li et al., 1995). In Vietnam, eight species of *Heterostemma* have been recognized (Costantin, 1912; Ho, 1993; Li et al., 1995; Tran, 2005): *H. acuminatum* Decne., *H. balansae* Costantin, *H. grandiflorum* Costantin, *H. oblongifolium* Costantin, *H. luteum* Costantin, *H. siamicum* Craib, *H. suberosum* Costantin, and *H. villosum* Costantin. We have confirmed a new species of *Heterostemma* among the collections from Phu Tho Province in Vietnam. The type locality is in Xuan Son in Phu Tho District, and the plants have been found growing on limestone in humid evergreen forest near the road at ca. 1000 m elevation. The new species differs from *H. grandiflorum* by the flower color, the absence of a peduncle, and the size of the corona. We herein describe and illustrate this new species as *H. xuansonense* T. B. Tran & Joo-Hwan Kim.

Heterostemma xuansonense T. B. Tran & Joo-Hwan Kim, sp. nov. TYPE: Vietnam. Phu Tho: Thanh Son, Xuan Son, 2 July 2003, *V. X. Phuong 6360* (holotype, MO; isotype, HN). Figures 1, 2.

Haec species *Heterostemmati grandifloro* Costantin et *H. oblongifolio* Costantin similis, sed a hoc laminae foliaris venis basalibus praesentibus atque flore majore, ab illo petiolo atque coronae lobis brevioribus, ab ambobus inflorescentia sessili, pedicellis brevioribus, corolla purpureo-rubella, sepalis triangularibus atque folliculo angustiore distinguitur.

Liana, at least 80 cm in length; stems pubescent, longitudinally grooved; internodes 5–20.5 cm. Petioles 1.2–2 cm, pubescent; leaves entire, opposite, pubescent on both surfaces, leaf blade oblong, ca. 7.5 × 3 cm, acuminate, base rounded to obtuse, oblique, with a group of glands adaxially; basal veins 3, lateral veins 5 to 6 pairs, diverging from the midribs 30°–45°. Inflorescences umbelliform, 1- to 6-flowered; peduncle absent; pedicels to 7 mm, with brown-red indument. Flowers ca. 2 cm diam.; flower buds 5-angled, ca. 1 cm diam.; sepals triangular, calyx tube 0.5–0.6 mm, lobes ca. 1.5 × 1 mm; external calyx surface glabrous to pilose, brown; internal surface glabrous, striped, yellow-brown, with 5 glands at base; corolla rotate, purple-red; corolla tube with equal lobes, 5–6 mm, lobes wider than long, pilose on both surfaces, margin ciliate; corona ca. 2.5 mm diam., pilose on both surfaces; corona lobes rounded, ca. 1 × 1 mm; pollinium ca. 0.22 × 0.18 mm; corpusculum ca. 0.17 mm high; gynostegium stelliform from above, ca. 0.5 mm diam.; ovary 2-carpellate, pilose, 0.8–1 mm high. Follicles in pairs, corniform, arcuate, glabrous, ca. 11 × 0.4 cm.

Distribution and habitat. *Heterostemma xuansonense* is endemic to Vietnam. It has been found growing on limestone in humid evergreen forests near the road at ca. 1000 m elevation.

IUCN Red List category. *Heterostemma xuansonense* should be considered Critically Endangered (CR B1ab[i]) according to IUCN Red List criteria

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Figure 1. *Heterostemma xuansonense* T. B. Tran & Joo-Hwan Kim. —A. Habit. —B. Floral bud. —C. Flower. —D. Follicles. —E. Pollinarium. Drawn from the holotype *V. X. Phuong 6360* (MO).

(IUCN, 2001). The extent of occurrence is estimated to be less than 100 km^2, and the species is known to exist at only a single location (Xuan Son commune). The continued decline of the known population is likely because the species is found near the side of the road, and the habitat is likely to be disturbed by road construction and repair.

Phenology. The new species was observed to flower and fruit in July.

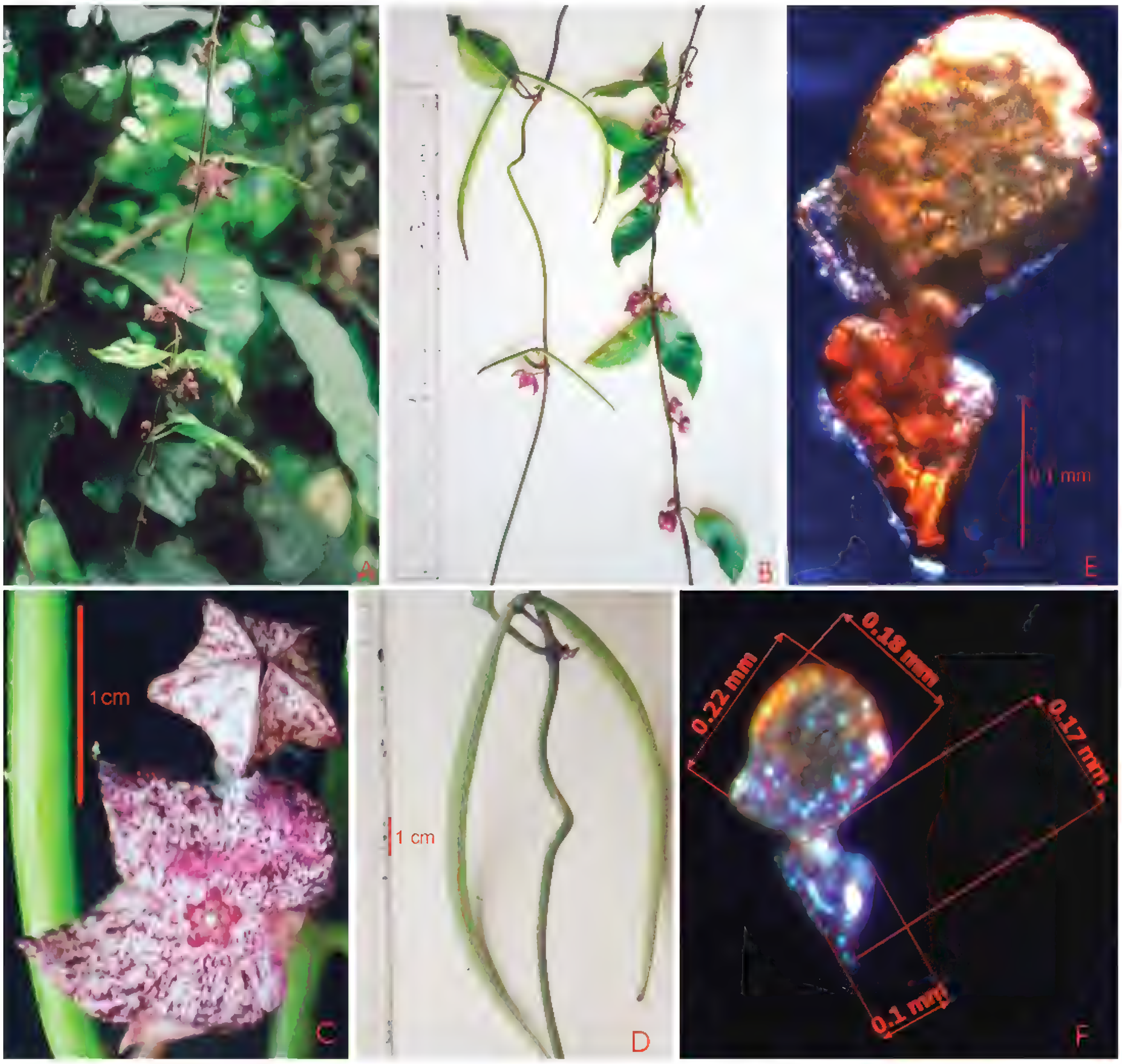

Figure 2. *Heterostemma xuansonense* T. B. Tran & Joo-Hwan Kim. —A. Habit. —B. Flowering branch. —C. Floral bud, flower. —D. Follicles. —E, F. Pollinarium. A, photo of the type plant taken at the type locality; B–D, from the type *Phuong 6360*; E, F, light microscopy images of the HN isotype (imaging performed at the Department of Life Science, Kyungwon University, Korea).

Etymology. The epithet of the new species is derived from the type locality (Xuan Son commune).

Relationships. Heterostemma xuansonense is closely related to *H. grandiflorum*, with which it shares the large flower (ca. 2 cm diam.) and the presence of three basal veins on the leaf blade. The new species differs mainly by its purple-red corolla (vs. yellow in *H. grandiflorum*) and in the absence of a peduncle (vs. peduncle 0.9–3 cm in *H. grandiflorum*). *Heterostemma oblongifolium*, another closely related species, distinctly differs from *H. xuansonense* in having a short peduncle and in the color and diameter of the flowers. The three species are compared in Table 1.

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Table 1. Morphological comparison of *Heterostemma xuansonense* and similar species.

	H. xuansonense	*H. grandiflorum*	*H. oblongifolium*
Basal veins on leaf blade	3	3	none
Petiole length (cm)	1.2–2	(2–)2.5–6.5	1.2–3(–4.5)
Leaf size (cm)	ca. 7.5 × 3	(7–)10–19 × (3.5–)5–10.5	7.5–14(–17.5) × (2.8–)3.5–5.4(–7)
Peduncle length (mm)	absent	9–25(–30)	1–2
Pedicel length (mm)	to 7	10–15(–40)	(8–)12–22(–35)
Flower diameter (cm)	ca. 2	ca. 2	1–1.5
Flower color	purple-red	yellow	yellowish or orange
Sepal shape	triangular	ovate	oblong
Corona lobe length (mm)	ca. 1	ca. 3	0.8–1.5
Follicle dimensions (cm)	ca. 11 × 0.4	10–12 × 0.7–1	12–13.5 × 0.9–1

Technology, for helping us collect specimens of *Heterostemma*.

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Meriania horrida (Melastomataceae), una Especie Nueva de Bolivia

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Resumen. Se describe e ilustra una especie nueva, *Meriania horrida* C. Ulloa & Achá (Melastomataceae), del departamento de La Paz, Bolivia. Esta especie se caracteriza por tener los tallos, pecíolos y ejes de las inflorescencias cubiertos por un indumento denso de conspicuos tricomas ásperos dendríticos; el ovario tiene lóbulos apicales carnosos y coloridos. Algunas hojas presentan acarodomacios basilaminares. Sólo se conoce de los bosques yungueños en los Andes bolivianos.

Abstract. A new species, *Meriania horrida* C. Ulloa & Achá (Melastomataceae), from the department of La Paz, Bolivia, is described and illustrated. This species is characterized by the stems, petioles, and axes of the inflorescences covered by a dense indumentum consisting of bristly dendritic trichomes, and by the ovary that presents apical fleshy colorful lobes. Some leaves present acarodomatia at the base of the blades. It is only known from the Yungas forests in the Bolivian Andes.

Key words: Acarodomatia, Andes, Bolivia, IUCN Red List, Melastomataceae, *Meriania*.

Entre el material colectado en el 2007 dentro del Parque Nacional Madidi en Bolivia se encuentra una llamativa especie nueva en el género *Meriania* Sw. (Melastomataceae) que describimos a continuación. *Meriania* se distribuye desde el sur de México (Chiapas) hasta el sureste de Brasil y en las Antillas; es el género más grande de la tribu Merianieae con alrededor de 78 especies (Almeda, 1993; Renner, 1993; Ulloa Ulloa & Homeier, 2008); en Bolivia se encuentran otras siete especies (Renner, com. pers.).

Meriania horrida C. Ulloa & Achá, sp. nov. TIPO: Bolivia. La Paz: Franz Tamayo, Parque Nac. Madidi, Keara, Ichucorpa, 14°38′33″S, 68°57′33″W, 2920 m, 4 nov. 2007, *A. Araujo-Murakami & N. Chapi 3961* (holotipo, LPB; isotipos, BOLV, K, MO, NY). Figuras 1, 2.

Haec species ab omnibus congeneris indumento denso ex trichomatibus dendriticis asperis conspicuis usque ad 12 mm longis constante ad caules petiolos et inflorescentiarum rhachides differt.

Arbustos de hasta 3 m; indumento de varios tipos de tricomas: el principal consiste de tricomas ásperos, dendríticos, con aspecto de musgos, con un estípite bien desarrollado, ancho a delgado, de un rosado obscuro y con varios brazos cortos y delgados, verdosos; entremezclados se encuentran tricomas ásperos no ramificados, rojizos; tricomas microscópicos dendríticos, sésiles, con brazos gruesos, amarillento claros; y tricomas microscópicos cortos, simples, rojizos; tallos cuadrangulares a rectangulares, 4–5 × 7–9 mm, engrosados en los nudos, densamente cubiertos por conspicuos tricomas dendríticos de hasta 12 mm y con tricomas microscópicos esparcidos, glabrescentes. Pecíolos 3–7.5 cm × 1.5–2.3 mm, teretes, algunas veces acanalados en la mitad superior por el lado adaxial, densamente cubiertos con tricomas dendríticos y tricomas no ramificados de 2–5.5 mm y con tricomas microscópicos simples y dendríticos entremezclados y dispersos, glabrescentes; líneas interpeciolares muy delgadas visibles en las ramas glabrescentes; hojas isomorfas, la lámina elíptica, anchamente elíptica a ligeramente obovada, 16–27 × 7.5–14 cm, membranácea, el ápice agudo, la base atenuada, el margen menudamente dentado, los nervios principales 5, marcadamente triplinerves a 10–23 mm de la base y con un par de nervios suprabasal a 5–13 mm de la base, rosado oscuros, la nervadura impresa en el haz, muy prominente en el envés, las secundarias separadas 3–5.5 mm, los nérvulos reticulados, el haz glabra, el envés con la superficie cubierta de tricomas microscópicos simples y dendríticos y las venas principales con tricomas similares a los del pecíolo, densos en la base y

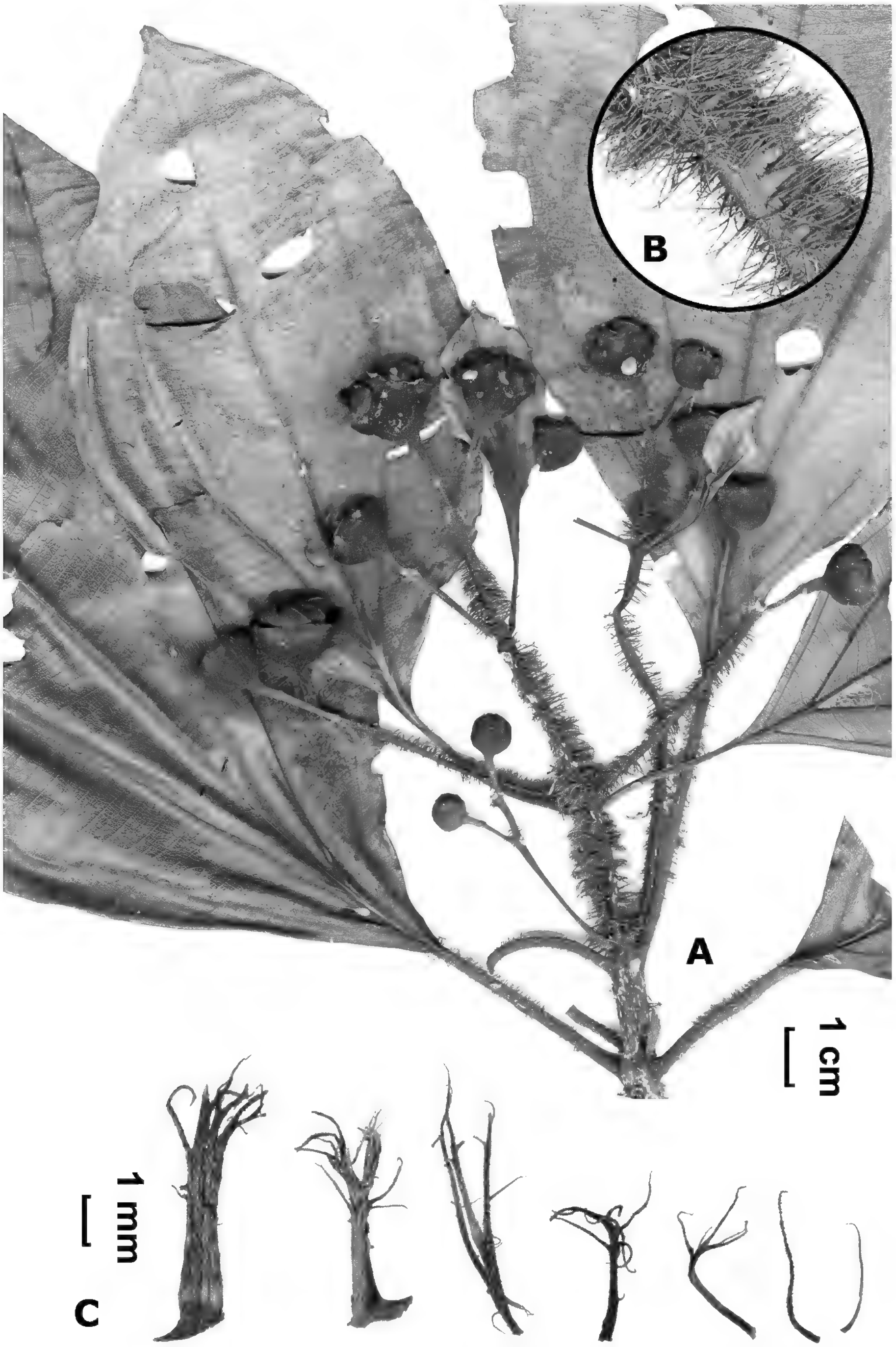
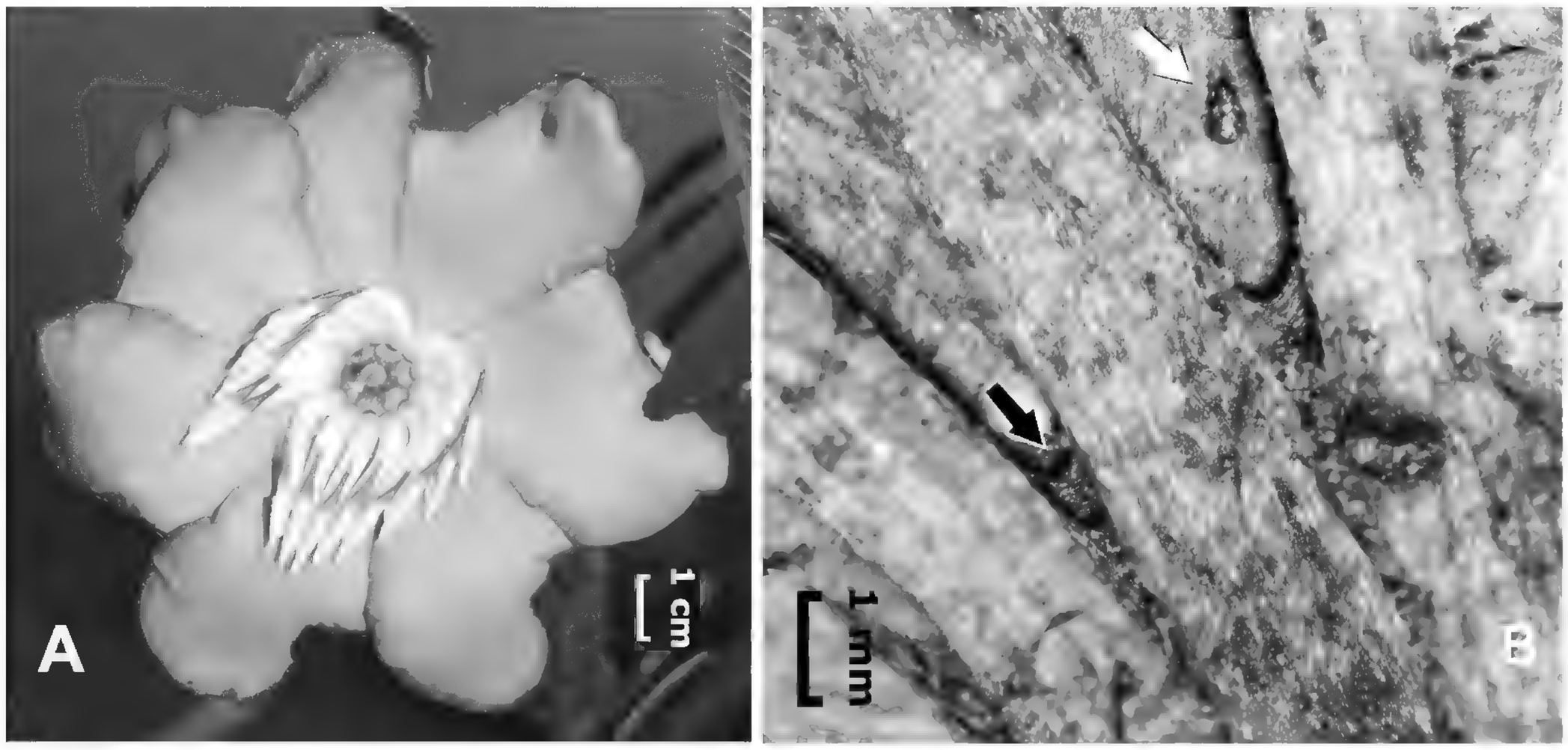


Figura 1. *Meriania horrida* C. Ulloa & Achá. —A. Inflorescencia. —B. Detalle del indumento de un eje de la inflorescencia. —C. Tipos de tricomas ásperos individuales (de izquierda a derecha) 1–5, tricomas dendríticos; 6–7 tricomas no ramificados; tricomas que se encuentran en los tallos (1, 2), en las inflorescencias (2 a 6), en los pecíolos y las nervaduras de las hojas (5 a 7). A–C, *Araujo-Murakami & Chapi 3957* (MO).



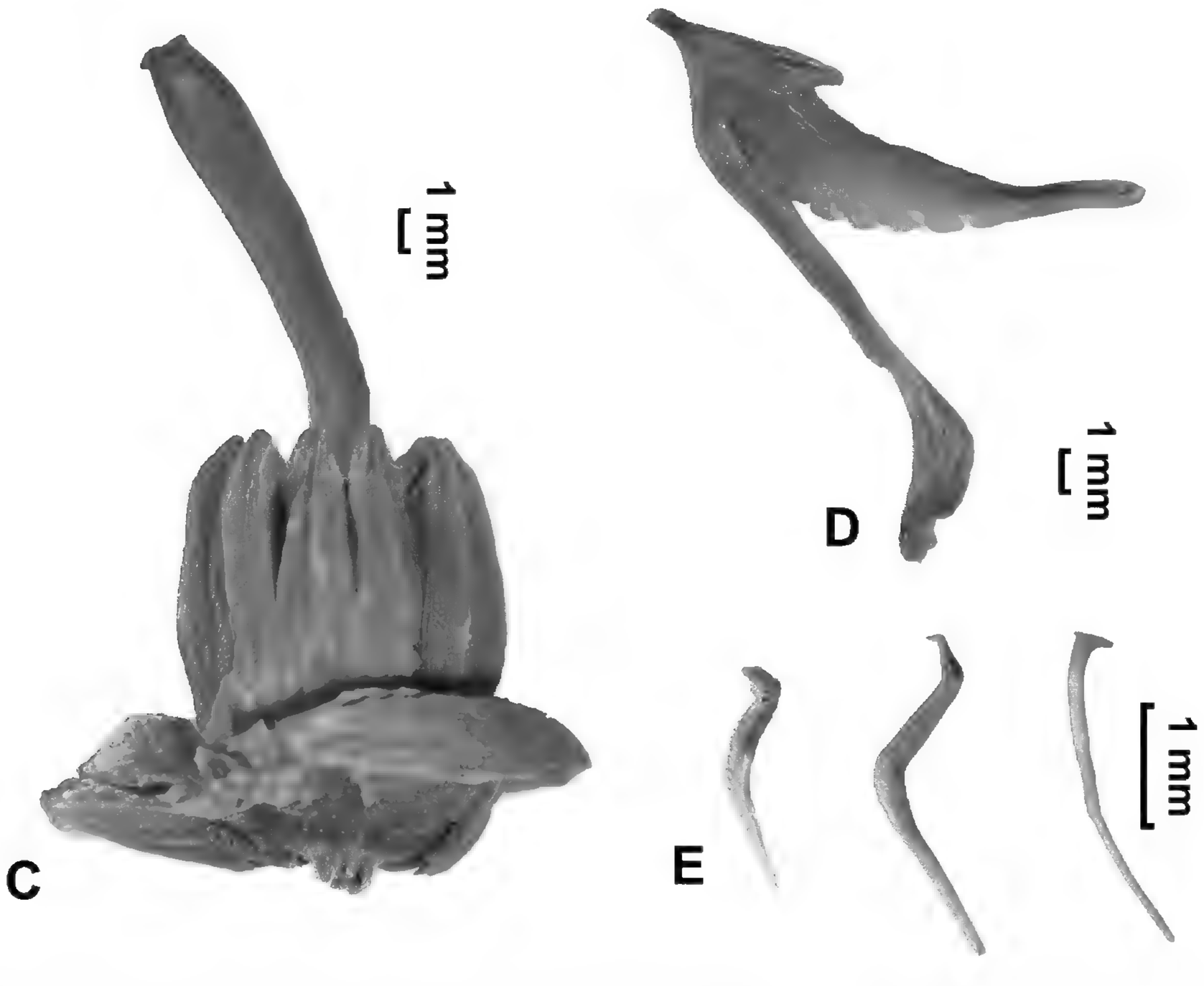


Figura 2. *Meriania horrida* C. Ulloa & Achá. —A. Flor en antesis. —B. Acarodomacios en las axilas entre el nervio principal y el primer par de nervios secundarios (flecha negra); se removieron algunos tricomas. La flecha blanca indica un ácaro. —C. Pistilo sobre el hipanto. —D. Estambre vista lateral. —E. Semillas. A, fotografía cortesía A. Araujo-Murakami; B, *Araujo-Murakami & Chapi 3957* (MO); C y D, *Araujo-Murakami & Chapi 3961* (MO, isotipo); E, *Fuentes 11846* (MO).

disminuyendo hacia el ápice; acarodomacios presentes a manera de diminutas bolsas de tejido (observados en pocas hojas) entre el nervio principal y el par principal de nervios secundarios por el envés. Inflorescencia un tirsoide compuesto, 11–20 cm (incluido el pedúnculo), con un par de brácteas foliáceas basales, 5.5–17 × 2.5–9 cm, iguales a las hojas pero más pequeñas, a veces otros pares de brácteas foliáceas más pequeñas presentes más arriba en la inflorescencia, los ejes principales densamente cubiertos por tricomas dendríticos estipitados, de hasta 5 mm, las ramificaciones de último orden con muy escasos tricomas dendríticos y con tricomas microscópicos esparcidos; tirsoide formado por tríades

de flores, en total hasta 36 flores; bractéolas muy tempranamente caducas (no observadas), dejando una cicatriz notoria. Flores 6(7)-meras, glabras; pedicelos 6–13 mm, rosado oscuros, microscópicamente furfuráceos; hipanto y pétalos de un morado obscuro casi negro brillante (flores cerradas); hipanto campanulado, 8–11 mm, terete, con verrugas dispersas y microscópicamente furfuráceo en la base, coriáceo; toro ca. 1 mm de ancho, coriáceo; tubo del cáliz terete, ca. 3 mm, los lóbulos del cáliz ovado-deprimidos, ca. 1.5 × 9 mm, mal definidos, ondulados, morado oscuros, los dientes exteriores del cáliz a manera de muñones en el centro de cada lóbulo calicino, 1–1.8 mm de diám., café obscuros; pétalos contortos, obovados, 30–40 × 30–35 mm, estrechos hacia la base, oblicuamente redondeados en el ápice, gruesos, patentes y ligeramente convexos en la floración, rosado intenso brillantes, apicalmente ciliados en las flores cerradas; estambres isomorfos, 12, 13 o 14, todos dirigidos hacia abajo en forma de abanico, geniculados en el punto de inserción del filamento, glabros; filamentos 9–12 mm, blanco brillantes con tintes rosados, complanados (una de la flores presenta fusión de dos filamentos), las tecas marcadamente subuladas, 8.5–10 mm, rosado-violáceas de la mitad hacia el poro, blancas hacia la inserción con el filamento, el poro apical dorsalmente inclinado, el conectivo no prolongado bajo las tecas, dilatado dorsalmente, 6.5–7 mm, blanco, con un apéndice subulado de ca. 1 mm, proyectado hacia afuera, con la punta rosada y un apéndice oblongo y romo, ca. 2 mm, proyectado hacia adentro; ovario 6-locular, libre, 8–10 mm de alto (incluidos los lóbulos), carnoso, conspicuamente acostillado, cada carpelo bilobulado en el ápice y prolongado 3.5–5 mm sobre la base del estilo, los lóbulos triangulares, agudos, separados en el ápice, rosado intensos, el estilo rosado intenso, terete, 9–15 × 1.2–1.5 mm, ligeramente declinado y curvado en el ápice, el estigma truncado, blanco, la placenta axilar, con forma de yunque, ocupando toda la cavidad del lóculo, los óvulos diminutos, alargados, numerosos. Frutos capsulares, 1.2–1.7 × 1.3–2.5 cm, más anchos que altos, loculicidas, con las valvas papiráceas persistentes, el hipanto persistente, cubriendo la base, los frutos viejos con restos fibrosos de las paredes; semillas muy numerosas, 2–4 mm, largamente cuneadas, arqueadas, deflexas, algunas con forma de S alargada, estrechas, lisas y brillantes.

Distribución, hábitat, fenología y conservación. Esta especie se conoce únicamente de tres localidades en bosques montanos yungueños dentro del Parque Nacional Madidi en el departamento de La Paz, provincia de Franz Tamayo, entre 2300 y 2920 m, en la vertiente oriental de los Andes bolivianos; crece junto a *Clethra cuneata* Rusby, *Hesperomeles ferruginea* (Pers.) Benth., *Weinmannia fagaroides* Kunth, *Myrsine dependens* (Ruiz & Pav.) Spreng. y especies de *Miconia* Ruiz & Pav. y *Clusia* L. Ha sido recolectada con flores en noviembre y con frutos en mayo y noviembre. El acceso al área donde crece esta especie es por caminos de mula y si bien existen trazos de carreteros para planes futuros, dudosamente afectarán a las poblaciones de esta especie que crecen en filos escarpados (A. Fuentes, com. pers.).

El área de ocupación (AOO) es de 27 km² (celdas de 3 × 3 km²) y su extensión de ocurrencia (EOO) es de 4.1 km², con el 0% de disminución futura (ya que 100% se encuentra dentro de un área protegida o área prístina). De acuerdo al conocimiento actual que tenemos para esta especie la categorización de amenaza según los criterios de la IUCN (2001) es de Preocupación Menor (LC) sobre la base del criterio B de tamaño del área de distribución geográfica (IUCN Standards and Petitions Working Group, 2008).

Etimología. El epíteto específico se refiere al denso indumento de tricomas ásperos (*horridus*), largos y ramificados que cubren los tallos, pecíolos y ejes de la inflorescencia.

Discusión. *Meriania horrida* se distingue de todas las especies del género por los conspicuos tricomas dendríticos que cubren los tallos, pecíolos y ejes de las inflorescencias. Dentro del género *Centronia* D. Don, género dudosamente distinto (actualmente bajo revisión por H. Mendoza, Bogotá, véase Triana [1871], Wurdack [1973], Almeda [1993], Schulman & Hyvönene [2003] acerca de la separación de este género), *C. mutisii* (Bonpl.) Triana presenta un indumento denso de tricomas largos, de hasta 5 mm que cubre los tallos, pecíolos, ejes de la inflorescencia, pedicelos y hasta la mitad del hipanto y entremezclados otros tricomas cortos, gruesos; ambas especies tienen estambres con proyecciones del conectivo similares y el ovario presenta lóbulos apicales, siendo los de *C. mutisii* más divididos. Sin embargo, en *C. mutisii* los tricomas largos son enteros, la especie es marcadamente distinta por las flores caliptradas la yema y los pétalos que se tornan azulados, las hojas son peltadas, acorazonadas y 7-nervias.

Dentro de las especies actualmente bajo *Meriania* algunas tienen notorio indumento, e.g., *M. tomentosa* (Cogn.) Wurdack, *M. macrophylla* (Benth.) Triana, *M. versicolor* L. Uribe, *M. weberbaueri* J. F. Macbr., pero éste no sobrepasa los 2 mm y los caracteres no son comparables con la especie nueva.

Meriania horrida se parece a *M. hexamera* Sprague, una especie ampliamente distribuida desde el sur de Colombia hasta el este de Perú entre 1100 y

2000(2200) m. Ambas especies tienen las inflorescencias robustas de tamaño y arreglo similares, con las brácteas foliáceas y bractéolas tempranamente caducas, los pedicelos robustos, las flores 6-meras de color magenta, el hipanto carnoso, los dientes exteriores del cáliz a manera de muñones, los pétalos de tamaño similar, los estambres isómeros, dirigidos hacia abajo en la flor, el ovario libre, carnoso con carpelos bilobulados en el ápice, las cápsulas están rodeadas por el hipanto en la base. Sin embargo, *M. hexamera* es una planta prácticamente glabra con indumento microscópico, las hojas son la mitad del tamaño (9–15 × 3.5–14 cm), cortamente acuminadas en el ápice, el margen entero, algunas veces revoluto en la base; el conectivo dilatado no presenta el apéndice romo proyectado hacia adentro y las anteras son tricolores, rosado-violáceas hacia el poro, blancas en el centro y amarillo intenso hacia la base dorso basal del conectivo, mientras en la nueva especie son bicolores, rosado-violáceas hacia el poro y blancas hacia la base; los lóbulos del ovario son redondeados mientras que son triangulares y agudos en la nueva especie. Las semillas de *M. hexamera* son largamente cuneadas, de hasta 2 mm, rectas.

Ambas especies presentan acarodomacios basilaminares por el envés de las hojas a manera de bolsas de tejido en la unión de los nervios. En *Meriania hexamera*, los domacios son bastante obvios en la unión de los tres nervios principales, donde se forman pequeñas bolsas huecas o se presentan a manera de una extensión incurvada de tejido basilateral a ambos lados del nervio principal. En *M. horrida* los domacios no se observaron sino en pocas hojas y son en forma de pequeñas bolsas en la unión de los nervios, se documenta también la presencia de diminutos ácaros (Fig. 2B). Si bien la presencia de tejido en la unión de los nervios no es rara en otros géneros de la familia, en *Meriania* se ha documentado en pocas especies (e.g., Goldenberg & Martins, 1999).

Paratipos. BOLIVIA. **La Paz:** Franz Tamayo, Parque Nac. Madidi, Keara, Ichucorpa, 14°38′33″S, 68°57′33″W, 4 nov. 2007, *A. Araujo-Murakami & N. Chapi 3957* (AAU, BOLV, CAS, LPB, M, MO, USZ); Parque Nac. Madidi, Mojos, Tocoaque, por el camino a Queara, 14°37′06″S, 68°57′07″W, 13 mayo 2007, *A. Fuentes 11846* (LPB, MO, NY); Parque Nac. Madidi, sector Santa Ana, por el antiguo camino Pelechuco–Apolo, subiendo cerro al SE del campamento, 14°46′30″S, 68°58′13″W, 25 jun. 2009, *A. Fuentes, J. Salas & R. Huasurco 14831* (BOLV, COL, LPB, MO, QCA).

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Taxonomic and Nomenclatural Changes in the *Ocotea indecora* Group (Lauraceae)

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ABSTRACT. Following a recent revision of the *Ocotea indecora* (Schott) Meisn. ex Mez group (Lauraceae), some taxonomic and nomenclatural changes have been made. We present here the resulting synonyms, together with typifications, and one new combination. Seven new synonyms are proposed. The following seven names are lectotypified: *Mespilodaphne indecora* (Schott) Meisn. var. *cannella* Meisn., *M. indecora* var. *intermedia* Meisn., *M. indecora* var. *laxa* Meisn., *M. indecora* var. *stricta* Meisn., *O. complicata* (Meisn.) Mez, *O. elegans* Mez, and *O. fasciculata* (Nees) Mez. *Mespilodaphne leucophloea* Nees & Mart. is transferred as *O. leucophloea* (Nees & Mart.) L. C. S. Assis & Mello-Silva.

RESUMO. Seguindo uma revisão recente do grupo *Ocotea indecora* (Schott) Meisn. ex Mez (Lauraceae), algumas mudanças taxonômicas e nomenclaturais têm sido feitas. Nós apresentamos aqui os sinônimos resultantes, juntos com tipificações e uma combinação nova. Sete sinônimos novos são propostos. Os sete nomes seguintes são lectotipificados: *Mespilodaphne indecora* (Schott) Meisn. var. *cannella* Meisn., *M. indecora* var. *intermedia* Meisn., *M. indecora* var. *laxa* Meisn., *M. indecora* var. *stricta* Meisn., *O. complicata* (Meisn.) Mez, *O. elegans* Mez e *O. fasciculata* (Nees) Mez. *Mespilodaphne leucophloea* Nees & Mart. é transferido como *O. leucophloea* (Nees & Mart.) L. C. S. Assis & Mello-Silva.

Key words: *Cinnamomum*, Lauraceae, *Mespilodaphne*, *Ocotea*, *Oreodaphne*, *Phyllostemonodaphne*.

Ocotea Aubl. is the largest genus of New World Lauraceae and comprises 300 to 350 Neotropical species plus 50 to 60 African species (Rohwer, 1993; Madriñán, 2004). It is highly diversified in lowland and montane forests from Mesoamerica to eastern Brazil (e.g., Rohwer, 1986; Oliveira-Filho & Fontes, 2000; Vicentini & van der Werff, 2000; van der Werff, 2002; Baitello & Marcovino, 2004; Madriñán, 2004; Assis et al., 2005; Quinet, 2005, 2006). The modern circumscription of *Ocotea* started with Mez (1889), who treated it in a much broader circumscription than that of Nees von Esenbeck (1833, 1836) or Meisner (1864, 1866). Almost 100 years later, Rohwer (1986) organized the genus in informal groups and provided a critical framework for future treatments (e.g., Rohwer, 1991; van der Werff, 1999, 2002). Despite the attention given to the circumscription of species, nomenclatural problems in *Ocotea* have been neglected (but see Moraes, 2009). In this article, the taxonomic and nomenclatural changes adopted to solve these problems are presented. Species circumscription here is based on the taxonomic species concept, in which a species is defined by an exclusive character or a combination of characters (Stuessy, 1990; Assis, 2010; Assis & Mello-Silva, 2010a, b).

TAXONOMIC AND NOMENCLATURAL CHANGES IN *OCOTEA*

1. **Ocotea fasciculata** (Nees) Mez, Jahrb. Königl. Bot. Gart. Berlin 5: 248. 1889. Basionym: *Oreodaphne fasciculata* Nees, Linnaea 21: 521. 1848. *Mespilodaphne fasciculata* (Nees) Meisn., Prodr. (DC.) 15(1): 108. 1864. TYPE: Guyana.

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"am Ufer des Flusses Rupununi," May 1843, *R. Schomburgk 1286* (lectotype, designated here, K 000352442; duplicates, B p.p. [2], K [3]).

Cinnamomum bahiense Vattimo-Gil, Rodriguésia 29(42): 128. 1977, syn. nov. TYPE: Brazil. Bahia: Itamaraju, faz. Boa Vista, 21 July 1971, *M. T. Monteiro 23489* (holotype, RB; isotype, SPF).

Ocotea complicata (Meisn.) Mez, Jahrb. Königl. Bot. Gart. Berlin 5: 247. 1889, syn. nov. Basionym: *Mespilodaphne complicata* Meisn., Prodr. (DC.) 15(1): 103. 1864. TYPE: Brazil. s. loc., s.d., *L. Riedel 766* (lectotype, designated here, G; duplicates, B, LE not seen).

Ocotea duckei Vattimo-Gil, Rodriguésia 23(35): 243. 1961, syn. nov. TYPE: Brazil. Ceará: Serra do Baturité, Bico Alto, ponta superior, 1000 m, Aug. 1908, *A. Ducke s.n.* (holotype, RB 20020; isotype, HBG).

Ocotea nunesii Vattimo-Gil, Arq. Jard. Bot. Rio de Janeiro 15: 142. 1957, syn. nov. TYPE: Brazil. Rio de Janeiro: Governador Portela (Vila), Monte Sinai, 1935, *G. M. Nunes 222* (holotype, RB; isotypes, HBG, SPF).

Ocotea scrobiculifera Vattimo-Gil, Rodriguésia 29(42): 129. 1977, syn. nov. TYPE: Brazil. Bahia: Itamaraju, faz. Palmeira, 29 July 1971, *M. T. Monteiro 23516* (holotype, RB [image seen]).

Nees von Esenbeck (1848) described *Oreodaphne fasciculata* based on *Schomburgk 1286*, but did not assign the holotype. *Schomburgk 1286* at B herbarium is a mixed collection, with materials from *Ocotea fasciculata* and *O. schomburgkiana* (Nees) Mez. The fuller collections at K herbarium, represented by four sheets, are not mixed for *Schomburgk 1286*, and the sheet K 000352442 is selected here as the lectotype of *O. fasciculata*.

Meisner (1864) cited *Aydendron firmulum* Nees & Mart., excluding its type, *Sellow s.n.*, in the synonymy of *Mespilodaphne complicata*. This is in accordance with the *International Code of Botanical Nomenclature* (McNeill et al., 2006: Art. 52.2). There are two syntypes of *Mespilodaphne complicata*: *Riedel 766* at G herbarium, in which the DC. Prodromus collection is housed, and *Martius s.n.* at M herbarium; *Riedel 766* is here designated as lectotype.

Cinnamomum Schaeff. is characterized by branchlets with continuous growth, usually tripliveined leaves, anthers with four to rarely two pollen sacs, and cupules mostly with persistent tepals on the rim at fruit maturity (van der Werff, 1991; Rohwer, 1993). In contrast, the type material of *C. bahiense*, *Monteiro 23489*, has branchlets with rhythmic growth (a kind of growth characterized by its periodicity, by cataphylls surrounding the buds, and by the leaves distinctly clustered at the top of the branchlets [Hallé et al., 1978; Assis & Mello-Silva, 2010b] and pinnate leaves, although fruits and cupules have not been seen. *Monteiro 23489* fits in our circumscription of *Ocotea fasciculata*, which has branchlets with rhythmic growth, usually arcuate leaves with areoles 0.2–0.7(–1) mm diam., and tepals three to four times longer than the anthers. Accordingly, *C. bahiense* is here synonymized under *O. fasciculata*. The same combination of characters is present in the type materials of *O. duckei* (*Ducke s.n.*), *O. nunesii* (*Nunes 222*), and *O. scrobiculifera* (*Monteiro 23516*). Thus, these three binomials are also placed in synonymy of *O. fasciculata*.

2. **Ocotea indecora** (Schott) Meisn. ex Mez, Jahrb. Königl. Bot. Gart. Berlin 5: 249. 1889. Basionym: *Persea indecora* Schott, in Spreng., Syst. Veg. 4(2): 405. 1827. *Oreodaphne indecora* (Schott) Nees, Syst. Laur. 407. 1836. *Mespilodaphne indecora* (Schott) Meisn., Prodr. (DC.) 15(1): 102. 1864. *Ocotea indecora* (Schott) Meisn., Prodr. (DC.) 15(1): 102. 1864, nom. inval. *Mespilodaphne indecora* (Schott) Meisn. var. *minor* Meisn., Prodr. (DC.) 15(1): 102. 1864, nom. inval. *Ocotea pretiosa* Mez var. *indecora* (Schott) Vattimo-Gil, Rodriguésia 25(37): 87. 1966. TYPE: Brazil. s. loc., s.d., *H. W. Schott s.n.* (lectotype, designated by Moraes [2009: 14], B 10 000017).

Mespilodaphne indecora (Schott) Meisn. var. *cannella* Meisn., Prodr. (DC.) 15(1): 103. 1864. TYPE: Brazil. s. loc., s.d., *H. W. Schott 4347* (lectotype, designated here, NY [image seen]).

Mespilodaphne indecora (Schott) Meisn. var. *intermedia* Meisn., Prodr. (DC.) 15(1): 102. 1864. TYPE: Brazil. Rio de Janeiro: 1832, *L. Riedel s.n.* (lectotype, designated here, K 000352446; duplicates, LE [image seen], NY [image seen]).

Mespilodaphne indecora (Schott) Meisn. var. *laxa* Meisn., Prodr. (DC.) 15(1): 102. 1864. TYPE: Brazil. Rio de Janeiro: 1832, *L. Riedel 481* (lectotype, designated here, LE [image seen]; duplicates, C, G p.p. [3], K p.p. [2], P, US [image seen]).

Mespilodaphne indecora (Schott) Meisn. var. *stricta* Meisn., Prodr. (DC.) 15(1): 102. 1864. TYPE: Brazil. Rio de Janeiro: July 1832, *L. Riedel 483* (lectotype, designated here, G; duplicates, C, K, LE [image seen], NY [image seen]).

Ocotea elegans Mez, Jahrb. Königl. Bot. Gart. Berlin 5: 253. 1889, syn. nov. TYPE: Brazil. Rio de Janeiro: "Serra da Estrella," 2 May 1880, *A. F. M. Glaziou 12133* (lectotype, designated here, P [with label Prêt N° 123 51/70]; duplicates, B [2], BR, C, E not seen, F [2] not seen, K, P [2]).

In describing *Persea indecora*, Schott (1827) did not cite the type material. Nevertheless, the unique known collection of *Persea indecora* with his handwriting is deposited in B herbarium, and it has been chosen as lectotype (Moraes, 2009).

Mez (1889) merged *Mespilodaphne indecora* var. *cannella* with *Acrodiclidium geminiflorum* Mez, subsequently combined in *Phyllostemonodaphne gemini-*

flora (Mez) Kosterm. (Kostermans, 1936). Rohwer (1988) considered *M. indecora* var. *cannella* a doubtful synonym of *P. geminiflora*. *Ocotea* and *Phyllostemonodaphne* Kosterm. are not easily distinguished in their vegetative states. However, *O. indecora* has branchlets with rhythmic growth, which contrasts sharply with the continuous growth in *Phyllostemonodaphne*. The type material of *M. indecora* var. *cannella*, *Schott 4347*, which is sterile, appears to have rhythmic growth, and thus we prefer to treat this variety as a synonym of *O. indecora*. The only known collection of *Schott 4347* (NY) is here selected as lectotype.

Among the probable syntypes of *Mespilodaphne indecora* var. *intermedia* (Meisner, 1864), *Riedel s.n.* (K) is selected here as lectotype because its vegetative and reproductive structures are better representative and conserved.

Mespilodaphne indecora var. *laxa* was based on *Riedel 481*, but Meisner (1864) did not assign the holotype. *Riedel 481* housed at G herbarium is composed of three sheets: two are mixed collections corresponding to *Ocotea indecora* var. *laxa* and the third sheet corresponds to *Phyllostemonodaphne geminiflora* (Mez, 1889; Rohwer, 1988). Rohwer (1988) stated that *Riedel 481* at K herbarium is also mixed, containing materials from both *O. indecora* and *P. geminiflora*. Although we believe the K collection to consist exclusively of materials from *M. indecora* var. *laxa*, we have selected the LE collection as lectotype because there is no confusion in its identity and because the vegetative and reproductive structures are well represented and conserved.

There are two syntypes of *Mespilodaphne indecora* var. *stricta* (Meisner, 1864): *Riedel 483* at G herbarium, in which the DC. Prodromus collection is housed, and *Schott 5610*, at M and US herbaria; *Riedel 483* is here designated as lectotype.

Mez (1889) referred to seven collections when describing *Ocotea elegans* but did not assign a holotype. These collections include: *Saint-Hilaire C¹.74* (P), *Claussen 79* (P), *Glaziou 12121* (B, C, K, P), *Glaziou 12133* (B, BR, C, K, P), *Weddel 230* (P), *Glaziou 17192* (B, BR, C, HBG, K, P), and *Mósen 3792* (HBG, P, S). *Glaziou 12133* at P herbarium has three sheets, and the sheet with the label Prêt N° 123 51/70 is selected here as lectotype because its vegetative and reproductive organs are well conserved and representative of the taxon and because it morphologically corresponds to specimens identified as *O. elegans* in several works (e.g., Oliveira-Filho & Fontes, 2000; Baitello & Marcovino, 2004; Quinet, 2006). Among the remaining syntypes, the following collections were excluded from our circumscription of *O. indecora*: *Glaziou 12121* and *Saint-Hilaire C¹.74* are considered *O. colophanthera* L. C. S. Assis & Mello-Silva, *Mósen 3792* (HBG, P, S [4]) refers to *O. catharinensis* Mez, and *Weddel 230* (P) is excluded to *O. fasciculata*.

Regarding the synonymies under *Ocotea indecora*, this is a widespread and highly polymorphic species encompassing all the variations characteristic of the binomial and four varieties synonymized above, which are based mainly on vegetative features such as leaf shape and venation.

3. Ocotea leucophloea (Nees & Mart.) L. C. S. Assis & Mello-Silva, comb. nov. Basionym: *Mespilodaphne leucophloea* Nees & Mart., Linnaea 8: 45. 1833. *Mespilodaphne indecora* (Schott) Meisn. var. *leucophloea* (Nees & Mart.) Meisn., Prodr. (DC.) 15(1): 103. 1864. TYPE: Brazil. s. loc., s.d., *F. Sellow 1372* (lectotype, designated by Nees von Esenbeck [1836: 240], B; duplicate, K).

In describing *Mespilodaphne leucophloea*, Nees von Esenbeck (1833) did not cite the number of the type material, *Sellow*. Three years later, the same author (Nees von Esenbeck, 1836) assigned *Sellow 1372*, deposited in B herbarium, as the type collection. In this manner he effected the lectotypification, although he did not explicitly state that he was doing so.

Although Bentham and Hooker (1880) considered *Mespilodaphne* Nees a synonym of *Ocotea*, it was primarily Mez (1889) who made the combinations from *Mespilodaphne* to *Ocotea*. In doing so, he treated *Mespilodaphne indecora* var. *leucophloea* as a synonym of *O. indecora*. We adopt here Mez's (1889) circumscription of *Ocotea*, but exclude *M. leucophloea* from the synonymy of *O. indecora*, thus making a new combination, *O. leucophloea*. The materials linked to *O. leucophloea* have yellow to cream young branchlets (vs. brown to gray, rarely cream in *O. indecora*), conspicuous rhytidome on the young branchlets (vs. absent to inconspicuous rhytidome), a strongly attenuate leaf base (vs. acute to obtuse), and larger leaf areoles (1–2.7 mm diam. vs. 0.3–1[–1.5] mm diam.).

4. Ocotea virgultosa (Nees) Mart. ex Mez, Jahrb. Königl. Bot. Gart. Berlin 5: 252. 1889. Basionym: *Nectandra virgultosa* Nees, Syst. Laur. 304. 1836. TYPE: Brazil. Minas Gerais: "in sylvulis udis depressis, Capões dictis," s.d., *C. F. P. Martius s.n.* (holotype, M).

Oreodaphne nitidula Nees & Mart. var. *cuneifolia* Meisn., Prodr. (DC.) 15(1): 136. 1864, syn. nov. TYPE: Brazil.

s. loc., s.d., *F. Sellow s.n.* (lectotype, designated by Moraes [2009: 35], B 10 0185392).

Oreodaphne nitidula var. *cuneifolia* is here synonymized with *Ocotea virgultosa* because their respective type collections, *Sellow s.n.* and *Martius s.n.*, have similar vegetative and reproductive parts.

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A New Species of *Anacampseros* (Portulacaceae) from South Africa

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Abstract. A new species of *Anacampseros* L., *A. decapitata* Burgoyne & J. van Thiel (Portulacaceae), a low-growing leaf succulent from the northwestern part of South Africa, is described. Morphological differences separate it from the two other species of the genus from the same region. Flower, fruit, and seed morphology together with distributional range are described in detail for the new species and compared to that of two associated species. The name *A. lubbersii* Bleck is neotypified.

Key words: *Anacampseros*, IUCN Red List, Portulacaceae, South Africa, succulent.

Ten years ago, the authors discovered independently that a tiny *Anacampseros* L. (Portulacaceae) growing in the Magaliesberg, west of Pretoria, South Africa, is a new species, belonging to a small group of related plants with seed belonging to the Subnuda type that includes *A. subnuda* Poelln. and *A. lubbersii* Bleck. The new species, *A. decapitata* Burgoyne & J. van Thiel, grows sympatrically with *A. subnuda*, but is distinguished from that taxon by its leaves. It more closely resembles *A. lubbersii*, which has a similar leaf shape but differs in its axillary bristles (cf. Table 1).

The genus *Anacampseros* comprises approximately 18 species, with the majority of these taxa found in the southern African subregion, from arid areas of Namibia in the west to higher rainfall areas of South Africa in the east. The genus is currently placed in the family Portulacaceae, which is paraphyletic according to Cuénoud et al. (2002). In her taxonomic treatment, Gerbaulet (1992) recognized two sections (section *Anacampseros* and section *Avonia* (E. Mey. ex Fenzl) Gerbaulet) within *Anacampseros*, which Rowley (1995) would later raise to the rank of genus. In the same treatment, Gerbaulet (1992) also reduced the rank of *A. lubbersii* to that of a subspecies of *A. subnuda*. It is our taxonomic preference to retain *A. lubbersii* at its original published rank.

Dyer and Verdoorn collected the first documented herbarium specimen of this new *Anacampseros* in 1939 (*Dyer & Verdoorn 3925*, PRE); this specimen was later identified by Gerbaulet as *A. subnuda* subsp. *subnuda* (Gerbaulet, 1992). Our examination of this specimen revealed characters that differ from *A. subnuda*, but that are similar to *A. decapitata*. *Anacampseros decapitata* differs morphologically from *A. subnuda* (Fig. 1A–E) by having leaves that are much more rounded (Fig. 1M), without the heavy verrucose surface seen in *A. subnuda*. The new taxon differs from *A. lubbersii* (Fig. 1F–I) by having numerous long flattened axillary bristles on the stems that protrude well beyond the leaf tips (cf. Fig. 1I, M). Further distinguishing characters for these three species are given in Table 1.

Closer examination of characters of *Anacampseros decapitata* has shown that this taxon also differs from its two closest allies by its flowering time, which is earlier in the day than either *A. subnuda* (Fig. 2A, D) or *A. lubbersii* (Fig. 2B, E) and of shorter duration. Flowers of *A. decapitata* (Fig. 2C, F) open only for approximately an hour and a half between 2:00 and 3:30 p.m. in northwestern Europe (van Thiel, pers. obs). They open only once, as for all *Anacampseros* species. Flowers of *A. subnuda* open in late afternoon for approximately three hours while those of *A. lubbersii* open from 1:00 to 3:00 p.m. for two hours (Burgoyne, pers. obs.). Pollination therefore is limited in *A. decapitata*, but self-pollination is ensured for most *Anacampseros* species with evidence of cleistogamy in many (Rowley, 1995). Having flowers that open only for a short while, however, contributes to effective water conservation in the dry habitat of the new species.

1. Anacampseros decapitata Burgoyne & J. van Thiel, sp. nov. TYPE: South Africa. North West Prov.: Rustenburg Distr., 2 Nov. 2006, *P. M. Burgoyne & J. van Thiel 2* (holotype, PRE; isotypes, BOL, K, MO). Figure 1J–M.

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Table 1. Morphological comparison of *Anacampseros decapitata*, *A. lubbersii*, and *A. subnuda*.

	A. decapitata	*A. lubbersii*	*A. subnuda*
Height of adult plant, cm	ca. 2	ca. 2	3–8
Leaf size, mm	ca. 3 × 4	ca. 4 × 6	ca. 5 × 8
Leaf surface	lightly rugose sculpting of leaf surface	heavily rugose sculpting of leaf surface	intricate verrucose sculpting of leaf surface
Axillary bristles	white, flattened, curled, to 15 × 2 mm (width at base)	absent	white, flattened, curled, to 15 × ca. 0.5 mm (width at base)
Axillary trichomes	white lanate clusters, 10 or more, exceeding leaf length	white lanate clusters, 3 to 4, never exceeding leaf length	white lanate clusters, 10 or more, exceeding leaf length
Flowers	deep bright pink	bright pink	pale pink or off-white

Haec species *Anacampseroti subnudae* Poelln. et *A. lubbersii* Bleck affinis, sed a hac setis axillaribus praesentibus atque trichomatibus axillaribus apices foliorum excedentibus, ab illa foliis apice rotundatis utrinque leviter rugosis (non verrucosis) atque floribus cerasino-rubris (non pallide roseis), ab ambabus foliis minoribus atque floribus in spatio temporis breviore aperientibus differt.

Perennial, monoecious; rootstock thickened, caudiciform, growing straight down with secondary roots radiating from central core as a result of the shallow soil conditions, side roots grow parallel to soil surface and may reach lengths of up to 150 mm, but never penetrate the soil deeper than 30 mm; stems borne above ground, short, thickened, succulent, branched to form short clumps or single plants only to 2 cm high; leaves obscuring internodes. Leaves spirally arranged, succulent; blades obovate, cuneate, rounded, ca. 3 × 4 mm, blade surfaces lightly rugose, stipules transformed into axillary trichomes and bristles, axillary trichomes 10 or more borne in a white lanate cluster, to 7 mm long, axillary bristles white, flattened, curly to 15 × 2 mm (width at base). Inflorescences 18–35 mm, with 1- to 5-flowered racemes, flowers developing acropetally, bracts 3–6 × ca. 2 mm (width at base), lanceolate, parchment-like, with a prominent midrib, white, 2 per node and opposite, with a basal tuft of fine, white trichomes < 1 mm. Flowers with pedicels 2–7 mm, basal pedicels longer; sepals 2, enveloping the unopened flower, dark coppery green, 3–8 mm, glabrous, shiny, deciduous after the seed basket has ripened (ca. 3 weeks), petals 5, 4–9 × 3–6 mm, apically rounded with a central fold, deep bright pink satiny appearance; stamens numerous; filaments white, capillaceous, 3–6 mm, shorter to slightly longer than the stigma; ovary superior, 1-celled; style pale yellow, 3–5 mm, stigma yellow, 3-fid, stigmatic surface minutely tuberculate; pollen yellow, pericolpate, polyaperturate. Fruits pale buff-colored, a hygroscopic capsule, 4–7 × 2–3 mm, with veins rarely subdividing, dehiscing along 3 of 5 sides; seeds ca. 20, colliculate, 0.6–0.9 mm, of Subnuda seed type (Gerbaulet, 1992).

Distribution and phytogeography. *Anacampseros decapitata* is known from two localities in the Magaliesberg, a prominent mountain range in the Rustenburg–Pretoria region of South Africa. The area falls within the Mesic Highveld Grassland Bioregion of the Grassland Biome and comprises Rand Highveld Grassland (Gm 11; Mucina et al., 2005). Plants were found in shallow soils derived from coarse quartzite and sandstone sediments of the Magaliesberg Formation of the Transvaal Sequence. They occurred at altitudes from 1688 to 1770 m in pockets of rough gravel with humus-rich soils. At these sites, drainage is very good as after rains the water seeps away through the porous strata. The full extent of the occurrence of *A. decapitata* is not yet known. Searches for it in the Magaliesberg in Gauteng Province have proved fruitless so far, but may yield specimens in the future.

IUCN Red List category. *Anacampseros decapitata* is considered rare and is assessed as Vulnerable (VU) according to criterion D2 of the IUCN Red List (IUCN, 2001). Only two subpopulations have been found and, although individual plants are relatively plentiful where it occurs (ca. 12 plants per m^2 in two patches of 500 m^2 and 100 m^2; Burgoyne, pers. obs.), it is potentially threatened by plant collecting and habitat disturbance/destruction as a result of sand and gravel mining.

Phenology. Inflorescences were produced from November to December (van Thiel & Burgoyne, pers. obs.). Flowers open only once for approximately an hour and a half between 2:00 and 3:30 p.m. under cultivation in northwestern Europe. Seeds ripen up to three weeks after flowering.

Etymology. The specific epithet is from the Latin "decapitare," meaning "to behead." During periods of drought stress, the tips of the stems become easily detached, roll away from the parent plant, and are spread by the wind, thus ensuring vegetative reproduction as cuttings of *Anacampseros* are easily rooted.

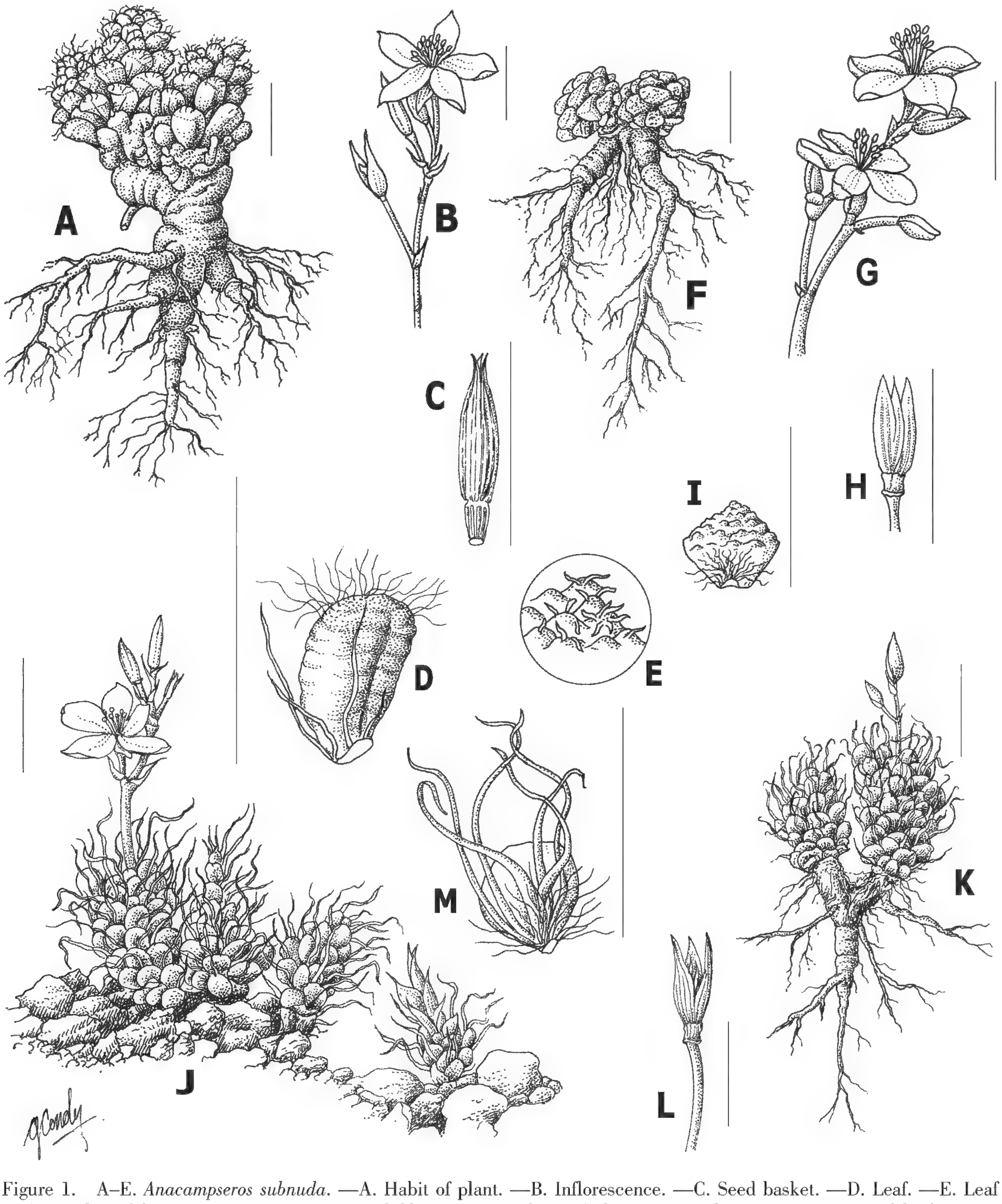

Figure 1. A–E. *Anacampseros subnuda*. —A. Habit of plant. —B. Inflorescence. —C. Seed basket. —D. Leaf. —E. Leaf surface enlarged by 100×. F–I. *Anacampseros lubbersii*. —F. Habitat of plant. —G. Inflorescence. —H. Seed basket. —I. Leaf. J–M. *Anacampseros decapitata*. —J. Habit of plant with flowers. —K. Habit of plant with buds. —L. Seed basket. —M. Leaf with long curly axillary bristles. A–E from *Bester 7313* (PRE); F–I from *Burgoyne & Burgoyne 25* (PRE); J–M from the type *Burgoyne & van Thiel 2*. All scale bars = 1 cm.

Paratypes. SOUTH AFRICA. **North West Prov.:** Rustenburg Distr., Magaliesberg, *A. Hankey 394* (PRE), *R. A. Dyer & I. Verdoorn 3925* (PRE).

Notes on Associated Species

Anacampseros lubbersii was first discovered by George Lubbers in 1954 from South Africa; it was later collected by McMurtry in 1983 (*McMurtry 4330*) and described by Bleck in 1984. Gerbaulet has since placed it as a subspecies of *A. subnuda* (Gerbaulet, 1992). We, however, believe that this taxon is sufficiently unique to warrant species status and thus recognize the taxon at species rank. Both the PRE holotype and the MO isotype cannot be traced, and it

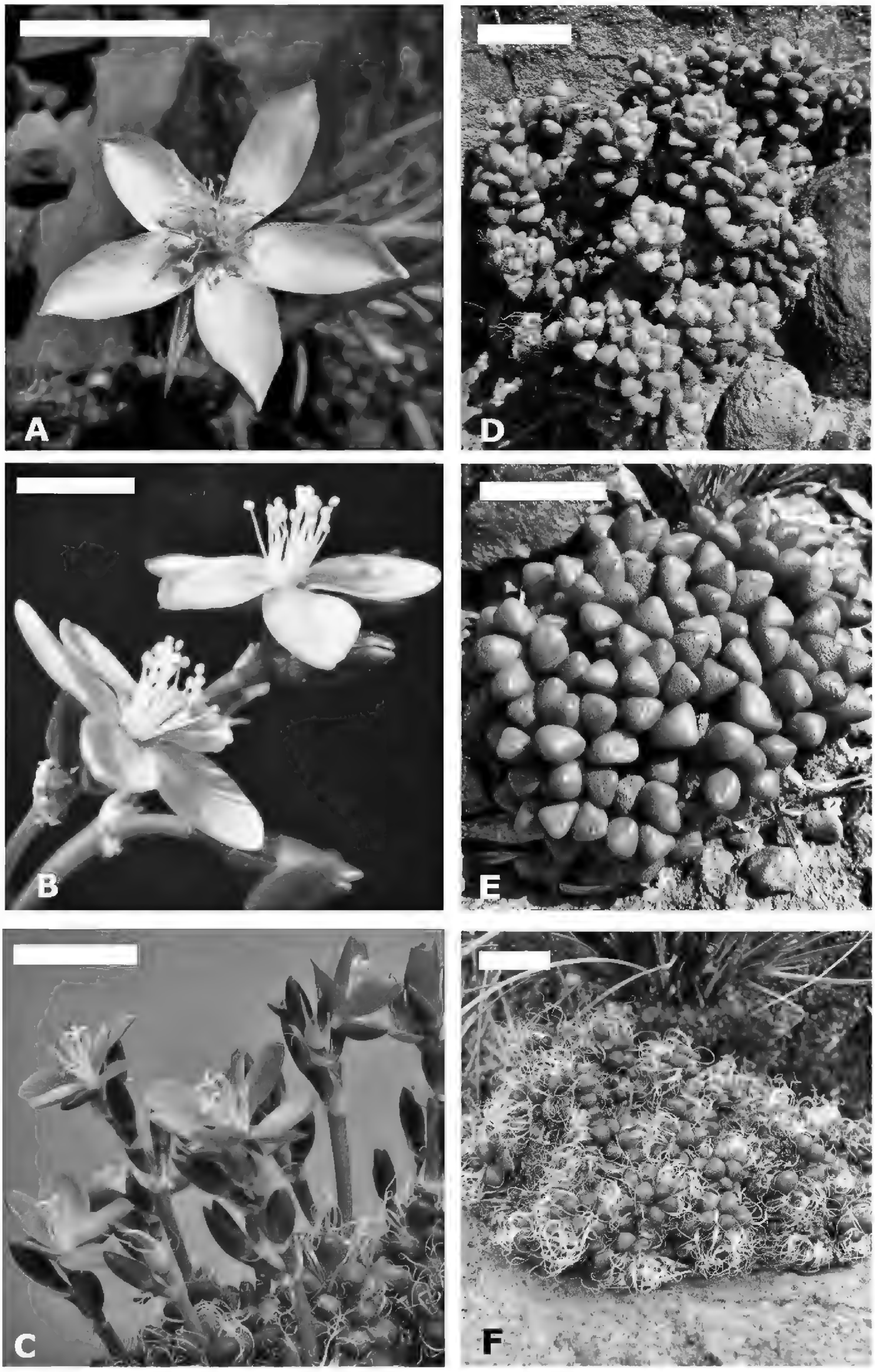

Figure 2. —A. *Anacampseros subnuda* flowers. —B. *Anacampseros lubbersii* flowers. —C. *Anacampseros decapitata* flowers. —D. *Anacampseros subnuda* habit. —E. *Anacampseros lubbersii* habit. —F. *Anacampseros decapitata* habit. A, D from *Burgoyne & Burgoyne 26* (PRE); B, E from *Burgoyne & Burgoyne 25* (PRE); C photo from live specimen; F from the type *Burgoyne & van Thiel 2* (PRE). All photos by P. M. Burgoyne, except C by J. van Thiel. Scale bars = 1 cm.

would appear that the type of this taxon was never incorporated in the National Herbarium (PRE), as it has never appeared on PRECIS computer records. Inquiries at the Missouri Botanical Garden also indicated that the isotype was not incorporated there. It may have been that live plants were studied by Gerbaulet, but never pressed by Bleck as Gerbaulet states that the type was seen (!) for the revision. Because Bleck did not cite any paratypes or other original material, we made efforts to locate specimens from the herbarium of the Johannesburg Botanic Garden, Emmarentia (JBG), where Bleck was stationed when she described the species, in order to select a lectotype from material that Bleck saw as required by the *International Code of Botanical Nomenclature* (McNeill et al., 2006: Art. 9.2, 9.9, 9.10). However, no specimens were deposited there and thus a neotype is designated here in accordance with the Code.

2. Anacampseros lubbersii Bleck, Cact. Succ. J. (Los Angeles) 56: 266. 1984. *Anacampseros subnuda* Poelln. subsp. *lubbersii* (Bleck) Gerbaulet, Bot. Jahrb. Syst. 113(4): 543. 1992. TYPE: South Africa. Mpumalanga Prov.: Middelburg Distr., 14 Nov. 2007, *P. M. Burgoyne 10,881* (neotype, PRE; duplicates, BOL, K, MO).

Specimens examined. SOUTH AFRICA. **Mpumalanga Prov.:** Middelburg Distr., slopes E of Middelburg Dam, *P. M. Burgoyne & E. J. Burgoyne 25* (PRE), *M. Jordaan 2951* (PRE).

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Two New Species of *Rhododendron* (Ericaceae) from Guizhou, China

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Abstract. Two new species, *Rhododendron huangpingense* Xiang Chen & Jia Y. Huang and *R. lilacinum* Xiang Chen & X. Chen (Ericaceae), from Guizhou Province, China, are described and illustrated. *Rhododendron huangpingense* is close to the morphologically similar species *R. oreodoxa* Franch. var. *adenostylosum* Fang & W. K. Hu and the sympatric species *R. decorum* Franch., from which it differs by having short yellowish brown hairs on the leaves, the rachis 15–18 mm long, a rose-colored corolla with deep rose flecks, and the stigma ca. 3.5 mm wide. *Rhododendron lilacinum* differs from the morphologically similar and sympatric species *R. simsii* Planch. by having smaller leaves, a shorter pedicel, a pale purple corolla, a smaller calyx, and shorter stamens. Both of the new species appear to be quite rare and therefore their conservation is highly desired.

Key words: China, Ericaceae, Guizhou, IUCN Red List, *Rhododendron*.

Baili Rhododendron Nature Reserve, a 125.8-km^2 highland located in northwest Guizhou Province, China, is characterized by a huge natural *Rhododendron* L. population comprising approximately 35 species of the genus. In the years 2007 and 2008, we conducted an intensive taxonomic survey of *Rhododendron* in the area and, based on careful examination of the relevant literature (Ming, 1984; Fang & Ming, 1986; Hu, 1988; Zhang & Chen, 1990; Hu & Fang, 1994; Chen & Wu, 2003; Chen & Xie, 2005; Fang et al., 2005; Yang et al., 2006) and hundreds of similar herbarium specimens, we describe two previously undescribed species here.

1. Rhododendron huangpingense Xiang Chen & Jia Y. Huang, sp. nov. TYPE: China. Guizhou: Baili Rhododendron Nature Reserve, Pudi, 27°14′N, 105°51′E, 1719 m, 22 Apr. 2008, *Xiang Chen 08024* (holotype, HGAS; isotype, MO). Figure 1.

Haec species inter congeneros sympatricos *Rhododendro decoro* Franch. simillima, sed ab eo foliorum indumento brevi flavidobrunneo, inflorescentiae rhachide 15–18 mm longa, corolla rosea atroroseo-punctata atque stigmate ca. 3.5 mm lato distinguitur.

Evergreen shrubs or small trees, 2.8–5.2 m tall; bark grayish brown, exfoliating into thin and small irregular flakes; branchlets glabrous. Petiole 1.4–2 cm, glabrous; leaf blade oblong or oblanceolate-elliptic, 9–12(−15) × 2.7–4.5 cm, base cuneate or obtuse, apex obtuse or rounded, apiculate, adaxial surface dark green, glabrous, abaxial surface pale yellowish green, sparsely puberulent, hairs denser along veins and yellowish brown; midrib slightly grooved adaxially, prominent abaxially; lateral veins in ca. 16 to 18 pairs, obscure adaxially, slightly raised abaxially. Inflorescences racemose-umbellate, 8- to 11-flowered; bud scales deciduous; rachis 15–18 mm, sparsely glandular-puberulent; pedicels rose-colored, 1–

Figure 1. *Rhododendron huangpingense* Xiang Chen & Jia Y. Huang. —A. Flowering branch. —B. Androecium and gynoecium, with the corolla removed. —C. Detail of the leaf blade abaxial surface. Drawn by H. Xie from the holotype *Xiang Chen 08024* (HGAS).

Table 1. Taxonomic comparison of *Rhododendron huangpingense* Xiang Chen & Jia Y. Huang, *R. oreodoxa* Franch. var. *adenostylosum* Fang & W. K. Hu (Hu, 1988; Hu & Fang, 1994; Fang et al., 2005), and *R. decorum* Franch. (Hu & Fang, 1994; Fang et al., 2005).

Characters	*R. huangpingense*	*R. oreodoxa* var. *adenostylosum*	*R. decorum*
Leaf blade abaxial surface color and vestiture	pale yellowish green, sparsely puberulent with yellowish brown hairs	pale green to whitish green, glabrous	whitish green, glabrous
Rachis length and vestiture	15–18 mm, sparsely glandular-puberulent	ca. 5 mm, glandular-tomentose	20–25 mm, sparsely glandular
Pedicel color and length	rose, 1–1.5 cm	purple, 0.5–1.5 cm	slightly reddish green, 2.5–4 cm
Corolla shape, color, and length	funnel-campanulate, rose, 4–5.5 cm	campanulate, pale pink, 3.5–4.5 cm	funnel-campanulate, usually white, 3–5 cm
Corolla scent and flecks	not fragrant, with deep rose flecks	not fragrant, with or without purple flecks	fragrant, with no flecks
Style length and stigma width	3.8–4.2 cm, ca. 3.5 mm	2.8–3.4 cm, 1.6–2.6 mm	3.4–4 cm, ca. 5 mm
Capsule length	1.9–2.4 cm	1.8–3.2 mm	2.5–4 cm
Geographic distribution	NW Guizhou, 1679–1719 m	W Sichuan, E Xizang, 3600–3900 m	SW China, 1000–3000 m

1.5 cm, densely glandular-hairy. Calyx lobes 5 or 6, ca. 1.5 mm, broadly triangular or ovate, margin sparsely glandular; corolla funnelform-campanulate, rose-colored with deep rose flecks, 4–5.5 × 5.5–7 cm when flattened, lobes 6 or 7, suborbicular, ca. 1.7 cm, emarginate, tube base sparsely glandular both outside and inside, without nectar pouches; stamens 13 to 15, unequal, 2.5–3.5 cm, filaments densely puberulent near base, anthers pale brown, ca. 2.5 mm; ovary conoid, 4–5.5 mm, densely yellowish glandular; style pale yellowish white, 3.8–4.2 cm, glandular-hairy to the tip; stigma pale brown, ca. 3.5 mm wide. Capsule cylindric, slightly curved, 1.9–2.4 × ca. 1 cm, with vestiges of glands.

Distribution, habitat, and IUCN Red List category. *Rhododendron huangpingense* is restricted to slopes in the Baili Rhododendron Nature Reserve, Pudi, Huangping County, Guizhou Province, China, where it grows in thickets dominated by *R. delavayi* Franch. and *R. agastum* Balf. f. & W. W. Sm. Since only two populations and a total of five mature individuals of this species were found in the area where the type collections were made, we make a preliminary conservation assessment for the species as Critically Endangered (CR), based on criterion D (population less than 50 mature individuals) of the IUCN Red List criteria (IUCN, 2001). Therefore, careful protection for the species is warranted. The current major threats to the species are human disturbance or damage (recreation/tourism), since its locality is a scenic spot in a rural mountain setting, and habitat loss (agriculture), despite the fact that the region is a provincial nature reserve. Fortunately, a few seedlings were found under the mature individuals, and one of the authors, Huang Jia-Yong, has collected seeds and begun a propagation experiment.

Phenology. The new species was observed in flower from April to May and in fruit from September to November.

Discussion. Species of *Rhododendron* subg. *Hymenanthes* (Blume) K. Koch sect. *Ponticum* G. Don subsect. *Fortunea* (Tagg) Sleumer are characterized by having glabrous branchlets, evergreen leaves without scales, terminal inflorescences, a 6- or 7-lobed corolla, 13 to 15 stamens, and a usually glandular ovary and style. Therefore, it is reasonable to assign *R. huangpingense* to this subsection. This new species is morphologically most similar to *R. oreodoxa* Franch. var. *adenostylosum* Fang & W. K. Hu, which belongs to the same subsection, but is an allopatric species found in Sichuan and Xizang provinces in China. In Baili Rhododendron Nature Reserve, the new species is most similar to the sympatric *R. decorum* Franch., also of the same subsection. These three taxa differ by the morphological characters listed in Table 1.

Paratype. CHINA. **Guizhou:** Baili Rhododendron Nature Reserve, Pudi, Huangping, 27°13′N, 105°51′E, alt. 1679 m, slope, in thickets dominated by *Rhododendron delavayi* and *R. agastum*, 21 Apr. 2008, *Xiang Chen 08018* (HGAS).

2. Rhododendron lilacinum Xiang Chen & X. Chen, sp. nov. TYPE: China. Guizhou: Baili Rhododendron Nature Reserve, Pudi, 27°13′N, 105°51′E, 1674 m, 20 Apr. 2008, *Xiang Chen 08008* (holotype, HGAS; isotype, MO). Figure 2.

Haec species *Rhododendro simsii* Planch. similis, sed ab ea foliis minoribus, pedicello breviore, corolla pallide purpurea atque calyce staminibusque brevioribus distinguitur.

Shrubs, deciduous, ca. 2 m tall; branchlets thin, densely dark brown strigose. Petioles 3–6 mm,

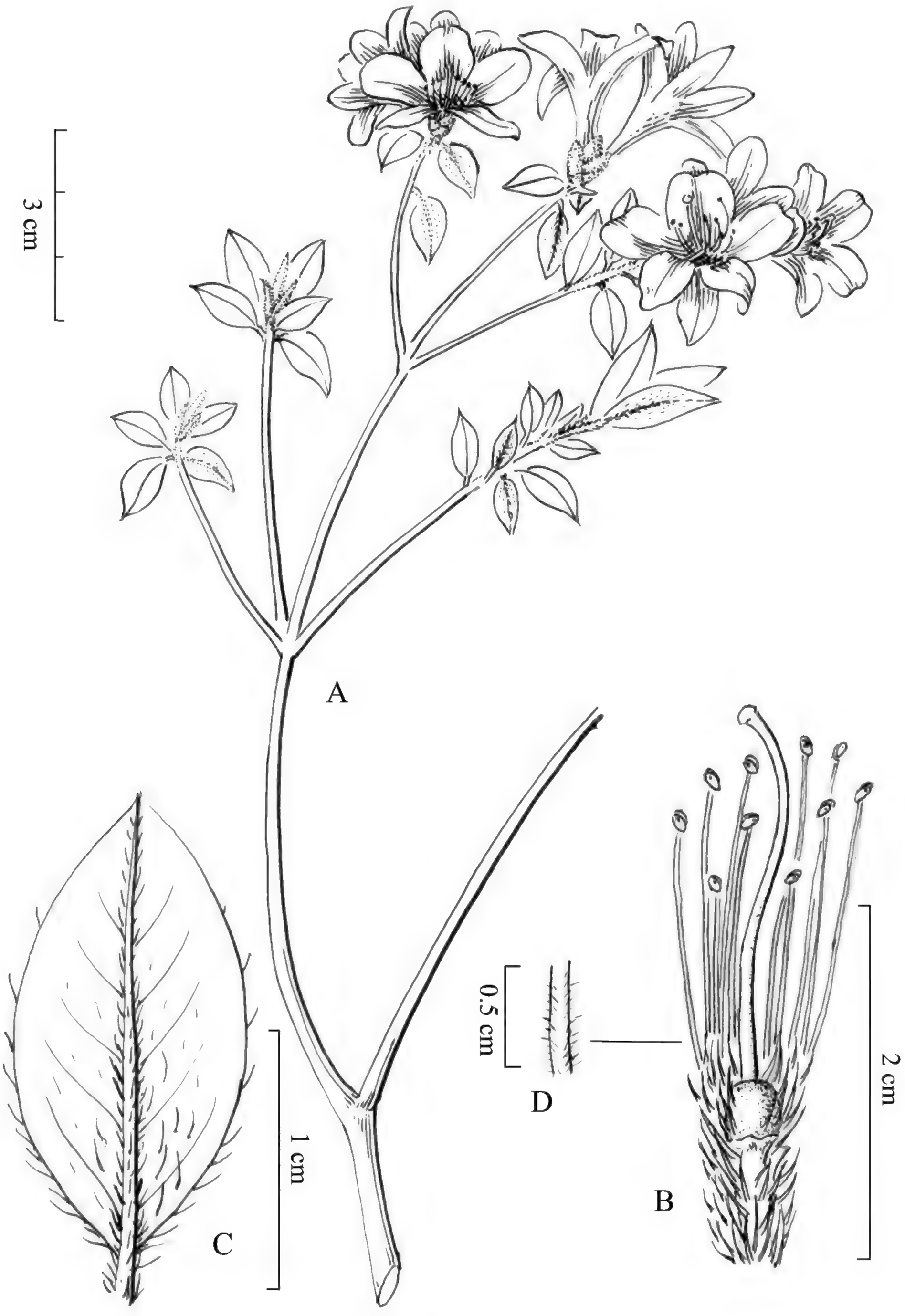

Figure 2. *Rhododendron lilacinum* Xiang Chen & X. Chen. —A. Flowering branch. —B. Androecium and gynoecium, with the corolla removed. —C. Enlargement of leaf blade abaxial surface. —D. Detail of filament base. Drawn by H. Xie from the holotype *Xiang Chen 08008* (HGAS).

densely dark brown strigose; leaf blade papery, somewhat thick, elliptic, 1.5–2.3 × 0.7–1 cm, margin entire, base cuneate or obtuse, apex acute, both surfaces coarsely pale brown strigose, hairs denser along midrib and on abaxial surfaces; midrib conspicuous on both surfaces; lateral veins in 5 to 8 pairs, obscure adaxially, slightly raised abaxially. Inflorescence terminal, umbellate, 2- or 3-flowered;

Table 2. Taxonomic comparison between *Rhododendron lilacinum* Xiang Chen & X. Chen and *R. simsii* Planch. (Hu & Fang, 1994; Fang et al., 2005).

Characters	*R. lilacinum*	*R. simsii*
Leaf blade shape, dimensions, and margin	elliptic, 1.5–2.3 × 0.7–1 cm, margin entire	ovate, elliptic-ovate, 1.5–5 × 0.5–3 cm, margin finely toothed
Pedicel length	2.5–3 mm	8 mm
Calyx length	ca. 1 mm	ca. 5 mm
Corolla shape and length	funnelform, ca. 2 cm	broadly funnelform, 3.5–4 cm
Corolla color and flecks	pale purple, with purple flecks	rose or bright to dark red, with dark red flecks
Stamen length	1.8–2.2 cm	3.5–4 cm
Distribution and altitude	NW Guizhou, ca. 1673–1674 m	most of the provinces in southern China, 500–2700 m

bud scales persistent, externally coarsely light brown strigose, margin ciliate; rachis very short; pedicel 2.5–3 mm, densely coarsely pale yellowish strigose. Calyx lobes triangular, ca. 1 mm, covered by pale yellowish strigose hairs; corolla funnelform, pale purple, ca. 2 cm; lobes 5, oblong, 1.3–1.5 cm, with purple flecks; corolla tube densely puberulent on the inner surface; stamens 10, unequal, 1.8–2.2 cm, slightly longer than corolla; filaments linear, densely puberulent near the base, anthers purplish brown, ovate, 1.5–2 mm; ovary ovoid, ca. 2 mm, densely pale yellow strigose; style longer than stamens, ca. 2.5 cm, glabrous.

Distribution, habitat, and IUCN Red List category. *Rhododendron lilacinum* is restricted to slopes in the Baili Rhododendron Nature Reserve, Pudi, Huangping County, Guizhou Province, China, where it grows in thickets dominated by *R. delavayi*, *R. irroratum* Franch., and *R. agastum*. The preliminary conservation assessment for the species is Endangered (EN), based on criterion D (population less than 50 mature individuals) of the IUCN Red List criteria (IUCN, 2001), since approximately 10 populations and fewer than 200 mature individuals were found in the area where field observations were conducted. Habitat loss (agriculture) and human disturbance (recreation/tourism) are the current major threats to the species as described for *R. huangpingense*. Fortunately, several new seedlings were found under the mature plants.

Phenology. The new species was observed in flower from April to May.

Discussion. *Rhododendron lilacinum* features strigose branchlets, deciduous and strigose leaf blades with no scales, and a terminal inflorescence, which are characteristic features of section *Tsutsusi* Sweet subg. *Tsutsusi* (Sweet) Pojark.; we therefore assign the new species to this section. This new species is similar to the sympatric *R. simsii* Planch., which belongs to the same section and is distinguished by the characters described in Table 2.

Paratype. CHINA. **Guizhou:** Baili Rhododendron Nature Reserve, Pudi, 27°13′N, 105°51′E, alt. 1673 m, slope, in thickets dominated by *R. delavayi*, *R. irroratum*, and *R. agastum*, 20 Apr. 2008, *Xiang Chen 08009* (HGAS).

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Impatiens oblongipetala (Balsaminaceae), a New Species from Yunnan, China

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ABSTRACT. A new species of *Impatiens* L., *I. oblongipetala* K. M. Liu & Y. Y. Cong (Balsaminaceae), from Yunnan Province, China, is described and illustrated, including its seed and pollen micromorphologies. This species is similar to *I. lecomtei* Hook. f. and *I. weihsiensis* Y. L. Chen, but differs by the white to slightly pink lateral sepals, the white lower sepal without purple striae, and the lateral united petals with apically retuse distal lobes.

Key words: Balsaminaceae, China, *Impatiens*, IUCN Red List, Yunnan.

Impatiens L. is the larger of two genera in the Balsaminaceae, with more than 900 species worldwide (Chen et al., 2008), and it occurs in tropical and subtropical mountains. Most of the species have very restricted distributions (Fischer & Rahelivololona, 2002). About 246 species of *Impatiens* (not including varieties) are distributed in China (Jin & Ding, 2002; Huang, 2006; Cai et al., 2008; Chen et al., 2008; Cong et al., 2008), of which 112 are found in Yunnan. This may suggest that a Chinese center for species diversity within the genus may be found in Yunnan.

Gaoligong Mountain National Nature Reserve lies in northwestern Yunnan Province, China. The reserve has been well protected by virtue of its remote location, and it is one of the richest biological resource areas in the world. There have been 4303 seed plant species and varieties recorded from Gaoligong Mountain National Nature Reserve (Li et al., 2000), including approximately 30 *Impatiens* species. In 2006, field expeditions were conducted to survey *Impatiens* and its biodiversity in the Gaoligong reserve. Several of the resulting collections could not be identified satisfactorily to existing species within *Impatiens*. After consulting the relevant literature (Chen, 1986; Akiyama et al., 1991; Huang, 2006; Chen et al., 2008) and numerous herbarium specimens (including those in PE and KUN), this taxon is proposed here as a new species.

MATERIALS AND METHODS

Mature pollen grains and seeds from fresh capsules and flowers of the holotype specimen of the new species (*Liu Ke-Ming & Cong Yi-Yan 791376*) were observed. Dried pollen grains and seeds from the holotype specimen were mounted on stubs with double-sided adhesive tape and sputter-coated with a layer of gold using the JFC-1600 Auto Fine Coater (JEOL, Ltd., Tokyo, Japan). These coated materials were then examined and photographed using the JSM-6360LV scanning electron microscope (JEOL, Ltd.). Polar lengths and equatorial diameters were then measured from 25 pollen grains and 25 seeds that were randomly chosen. Micromorphological characters were described for pollen (Walker & Doyle, 1975; Wang & Wang, 1983) and seeds (Liu et al., 2004), respectively.

Impatiens oblongipetala K. M. Liu & Y. Y. Cong, sp. nov. TYPE: China. Yunnan: Fugong Co., Gaoligong Mtn. Natl. Nature Reserve, 2850 m, 98.8114°E, 26.6797°N, in moist bush, 8 Oct. 2006, *Ke-Ming Liu & Yi-Yan Cong 791376* (holotype, HNNU; isotypes, HNNU [4], MO). Figures 1, 2.

Species *Impatienti lecomtei* Hook. f. et *I. weihsiensi* Y. L. Chen similis, sed ab eis sepalis lateralibus minoribus albis usque leviter roseis, sepalo inferiore albo estriato 6–7 mm profundo, lobis terminalibus petalorum lateralium majoribus oblongis vel suboblongis apice retuso differt.

Annual herb, 55–110 cm tall; stems erect, slender, branched, sparsely glandular-hairy. Leaves alternate; petioles 5–25 mm on basal leaves, gradually shortening to subsessile apically; leaf blade oblong, ovate-oblong, or oblong-lanceolate, 4.5–9 × 2.4–4 cm, membranous, pinnately veined with 5 to 8 secondary pairs, blade base cuneate, or apical blades subrounded or slightly cordate, margin crenate to serrate, teeth mucronate, apex caudate to acuminate. Inflorescences in upper leaf axils, 1-flowered, rarely 2-flowered; peduncles erect, 7–15 mm; pedicels bracteate at middle or above; bracts persistent, ovate, ca. 4 mm, apex acute. Flowers pale rose pink, 33–38 mm; lateral sepals 2, white to slightly pink, orbicular, 6–9 mm diam., entire, base slightly oblique, abaxial midvein narrowly thickened, otherwise 7-veined;

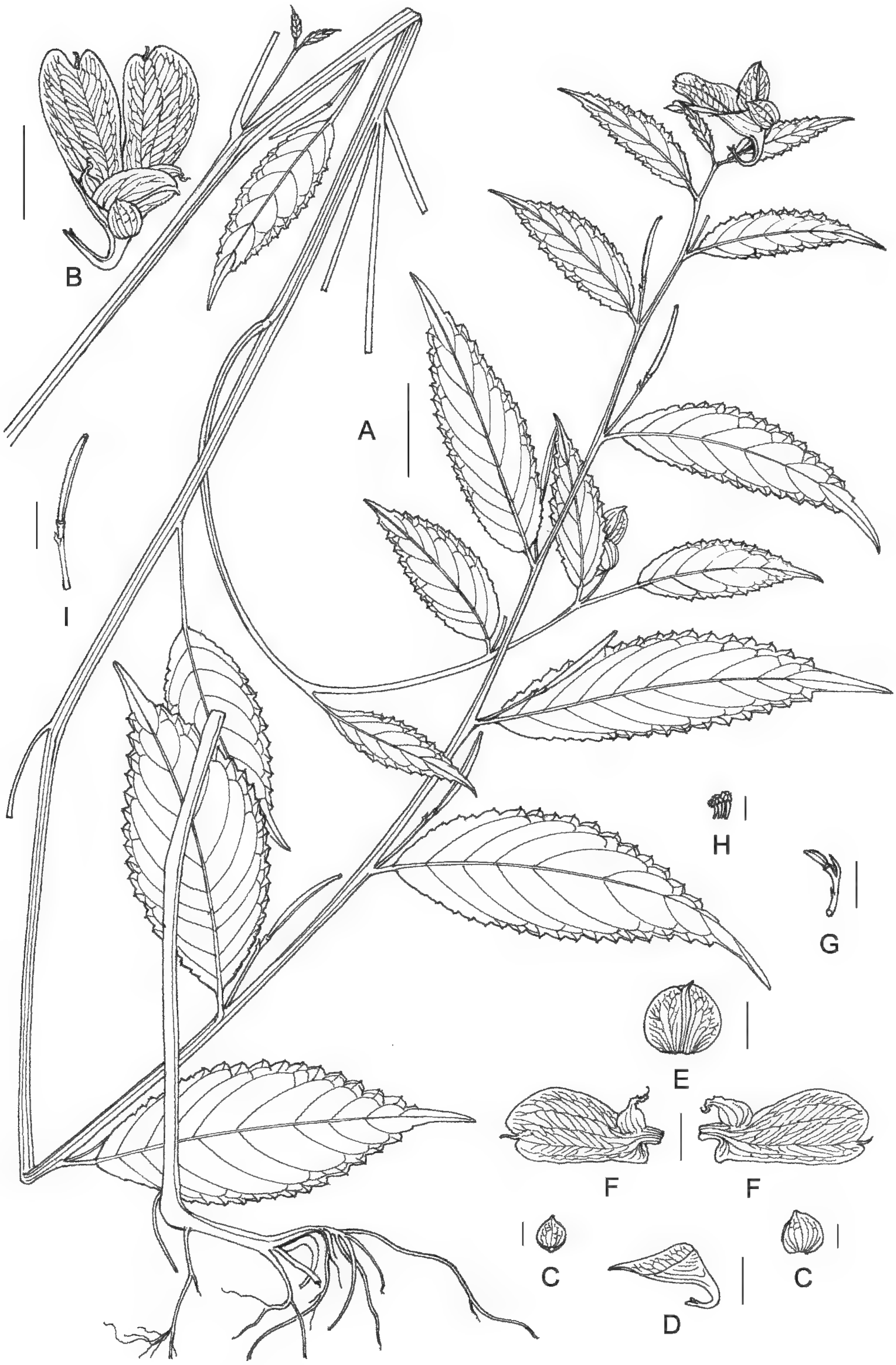

Figure 1. *Impatiens oblongipetala* K. M. Liu & Y. Y. Cong. —A. Fertile plant habit. —B. Flower, lateral view. —C. Lateral sepals. —D. Lower sepal. —E. Dorsal petal. —F. Lateral united petals. —G. Gynoecium. —H. Androecium. —I. Fruit. Scale bars: A, B = 2 cm; C, H = 5 mm; D–G, I = 1 cm. Drawn from the holotype, *Liu & Cong 791376* (HNNU).

lower sepal white, broadly funnelform, 6–7 mm deep excluding the spur, mouth 16–18 mm wide, base narrowed into an incurved spur; spur 13–15 mm, 2-lobed, lobe 1–1.5 mm; dorsal petal broadly ovate-flabellate, 10–17 mm diam., abaxial midvein narrowly cristate; lateral united petals clawed, 32–37 mm, 2-lobed; basal lobes (upper petals) small, broadly ovate, 5–7 × 4–5 mm, petal apex with a 3–4 mm filamentous

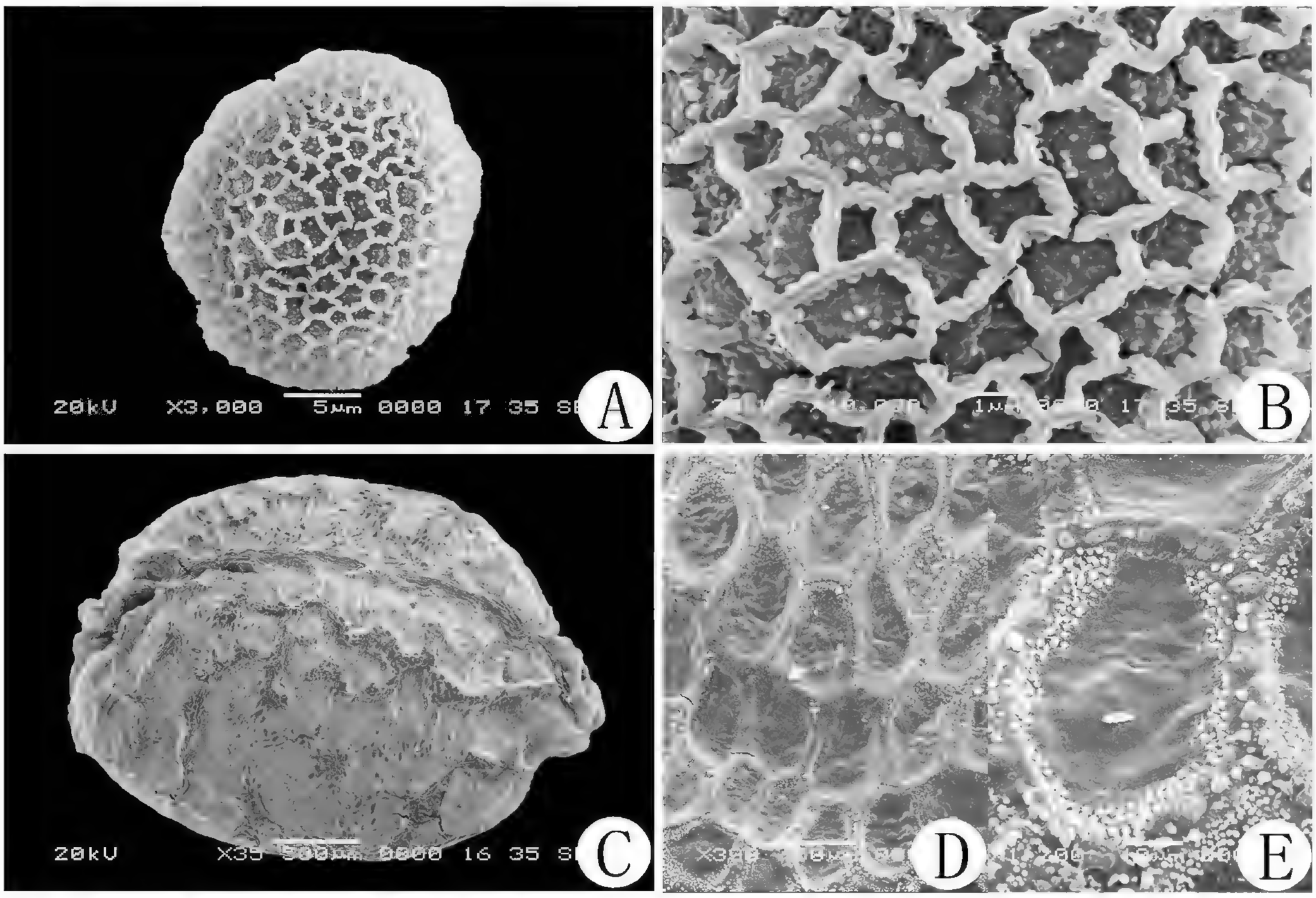

Figure 2. Pollen and seed micromorphology of *Impatiens oblongipetala* K. M. Liu & Y. Y. Cong. —A. Entire pollen grain. —B. Pollen sexine with reticulate ornamentation. —C. Intact seed. —D. Seed epidermis with reticulate ornamentation. —E. Seed epidermis, showing microgranules on muri. Vouchered from the holotype, *Liu & Cong 791376* (HNNU).

extension; distal lobes (lower petals) large, 28–32 × 15–17 mm, oblong or suboblong, apex retuse with a ca. 2 mm seta; abaxial auricle inflexed, 3.5–4 mm; stamens 5, filaments linear, ca. 4.5 mm; anthers ovoid, apex obtuse; ovary 5-carpellate, fusiform, 3.5–4 mm. Capsule linear, 18–29 × 2–2.5 mm, apex long acuminate, 5-valved.

Palynology. Pollen grains are subellipsoid, 4-colpate, with a polar:equatorial ratio of 22.73–28.18:18.19–20.91 μm (Fig. 2A). The pollen sexine reveals irregularly reticulate ornamentation, and granulate protrusions can be seen under high magnification (Fig. 2B).

Seed micromorphology. Seeds are ellipsoid or subellipsoid, yellow-brown in color, with a polar: equatorial ratio of 3.5–3.9:2.5–3 mm (Fig. 2C). The outer periclinal wall of the epidermal cells of the seed coat slightly bulges to form reticulate ornamentation (Fig. 2D); some microgranules on the muri can be seen under high magnification (Fig. 2E).

Distribution and habitat. *Impatiens oblongipetala* was noted to grow in damp undergrowth at 2700–2850 m elevation in Fugong County in northwestern Yunnan Province, China; the new taxon is known only from the type locality.

IUCN Red List category. *Impatiens oblongipetala* is not common in Fugong County, and it is known only from the strictly protected core zone of Gaoligong Mountain National Nature Reserve. Therefore, we recommend that the taxon be considered of Least Concern (LC), according to IUCN Red List criteria (IUCN, 2001).

Phenology. The new species was observed to flower and fruit from August to October.

Etymology. The specific epithet is from the Latin "oblongipetala" and refers to the oblong distal lobes of the lateral united petals.

Morphological notes. *Impatiens oblongipetala* is similar to *I. lecomtei* Hook. f. and *I. weihsiensis* Y. L. Chen in having pink flowers, the basal lobes of the lateral united petals each bearing an apical long filamentous extension, and the distal lobes of the lateral united petals with an apical seta. However, the new species is readily distinguished from the latter two by the white to slightly pink lateral sepals 6–9 mm diam.; the lower sepal that is white, less deep, and without purple striae; and the distal lobes of the

Table 1. Morphological comparison of *Impatiens oblongipetala*, *I. lecomtei*, and *I. weihsiensis*.

Characters	*I. oblongipetala*	*I. lecomtei*	*I. weihsiensis*
Inflorescences	1-flowered, rarely 2-flowered	1-flowered	1-flowered
Lateral sepals	white to slightly pink, 6–9 mm diam.	green or purple, 10–15 mm diam.	purple, 11–12 mm diam.
Lower sepal	white, without purple striae, 6–7 mm deep excluding the spur, mouth 16–18 mm wide; spur 13–15 mm, lobe 1–1.5 mm	pale yellow, with purple striae, 20–25 mm deep excluding the spur, mouth 19–25 mm wide; spur ca. 9–10 mm, lobe 3–3.5 mm	pale yellow, with purple striae, 17–18 mm deep excluding the spur, mouth 20–21 mm wide; spur 7–8 mm, lobe 2.7–3.2 mm
Dorsal petal	broadly ovate-flabellate, 10–17 mm diam., margin entire	orbicular, 18–22 mm diam., margin entire	orbicular, 11–13 mm diam., margin 4- or 5-denticulate on one side
Lateral united petals	clawed; distal lobes 28–32 × 15–17 mm, oblong or suboblong, apex retuse, with a seta	± clawed; distal lobes 19–22 × 8–11 mm, dolabriform, apex entire, with a seta	± clawed; distal lobes 18–20 × 9–10 mm, orbicular-dolabriform, apex entire, with a seta

lateral united petals that are larger, oblong or suboblong, and apically retuse. A more detailed comparison of these three species is presented in Table 1.

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Scutellaria sipilensis (Lamiaceae), una Especie Nueva para el Occidente de México

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Resumen. Se propone como especie nueva a *Scutellaria sipilensis* Cuevas (Lamiaceae), del estado de Jalisco, México, la cual encuentra acomodo en la sección *Cardinales* Epling o en el grupo de especies "speciosa" de Paton. Está relacionada con *S. longifolia* Benth., *S. glabra* Leonard, *S. saslayensis* A. Pool y *S. rosei* Fernald, de las cuales se diferencia por sus hojas anchamente ovadas, sus tricomas de mayor tamaño, sus brácteas persistentes y en general las estructuras florales más pequeñas.

Abstract. *Scutellaria sipilensis* Cuevas (Lamiaceae) is proposed as a new species from Jalisco, Mexico, which is accommodated within section *Cardinales* Epling or in the species group "speciosa" as defined by Paton. The species is related to *S. longifolia* Benth., *S. glabra* Leonard, *S. saslayensis* A. Pool, and *S. rosei* Fernald, from which it differs by its widely ovate leaves, trichomes of greater size, persistent bracts, and in general by its much smaller floral structures.

Key words: IUCN Red List, Jalisco, Lamiaceae, Mexico, *Scutellaria*, section *Cardinales*.

A través del inventario florístico para el cerro El Sípil, en parte de los municipios de Casimiro Castillo, Cuautitlán y La Huerta, en la costa sur de Jalisco, en el occidente de México, encontramos ejemplares de una especie de *Scutellaria* L. (Lamiaceae), sin referencia en la literatura existente para el género, razón por la cual la proponemos como nueva.

Scutellaria sipilensis Cuevas, sp. nov. TIPO: México. Jalisco: Mpio. Cuautitlán de García Barragán, 1.5 km O del Charco Azul, camino a la parte alta del cerro El Sípil, 19°30′N, 104°27.4′O, bosque tropical subcaducifolio, 980–1000 m, 28 nov. 2008 (fl., fr.), *R. Cuevas G., C. Rodríguez G., F. Fregoso G. y J. Hernández 9161* (holotipo, ZEA). Figura 1.

Haec species *Scutellariae longifoliae* Benth. affinis, sed ab ea foliis late ovatis vel suborbicularibus, bracteis persistentibus, floribus minoribus atque corolla scarlatina distinguitur.

Hierba perenne a subarbusto, 40–100 cm de altura; rizomas horizontales y cortos, con raíces fibrosas; con un tallo cuadrangular o cilíndrico, indumentado a glabrescente, con tricomas multicelulares y eglandulares, los horizontales o ligeramente retrorsos 0.5–1 mm, los fuertemente retrorsos 0.10–0.15 mm. Hojas anchamente ovadas a suborbiculares y comúnmente asimétricas, subcoriáceas, 4–10 × 3–7 cm, los pares inferiores a las inflorescencias 2–2.5 × 1.5–2 cm; haz verde oscuro, con algunos tricomas multicelulares dispersos sobre la superficie y más o menos frecuentes sobre los nervios, 0.2–1 mm, glabrescente; envés verde-amarillento, glándulas, 0.04–0.06 mm, amarillentas, la indumentación de tricomas blancos, concentrada sobre los nervios, 0.3–0.6 mm, horizontales o antrorsos, a glabro; ápice agudo a cortamente acuminado, rara vez redondo; margen crenado a dentado, los dientes partiendo de 1/5–1/4 arriba de la base, 8 a 12 por lado; base redonda a subcordada o cuneada y la lámina decurrente sobre el pecíolo; pecíolos 1.5–4.5 cm × 1–1.2 mm, los de los últimos pares de hojas 5–7 × 0.5–0.75 mm, con pubescencia de pelos horizontales o ligeramente retrorsos 1–1.2 mm, los retrorsos 0.3 mm. Inflorescencias en racimos terminales y axilares, 5.5–19 cm, pedúnculos 1–6.5 cm, densamente blanco-pubescentes, tricomas horizontales y ligeramente retrorsos 0.1–0.28 mm, los retrorsos 0.10–0.17 mm; 1 a 4 pares de brácteas foliáceas en la base de la inflorescencia; flores basales opuestas y alternas, espiraladas arriba, en ocasiones algunas verticiladas, secundas en antesis; pedicelos 2–3 mm de largo, diminutamente estrigosos; brácteas persistentes, las brácteas foliáceas elípticas a anchamente ovadas, 6–12 × 3–7 mm, estrigosas sobre los nervios en la parte abaxial, glandulosas, glabras en la parte adaxial, ápice agudo, margen serrado y ciliado, base cuneada a cordada, pecíolo 1–1.5 mm, estrigoso; las brácteas no foliáceas elíptico-lanceoladas a ovadas, 2–12 × 0.5–6 mm, glabras en la parte adaxial, estrigosas y glandulares en la abaxial, ápice agudo, margen entero y ciliado, base cuneada, pecíolo

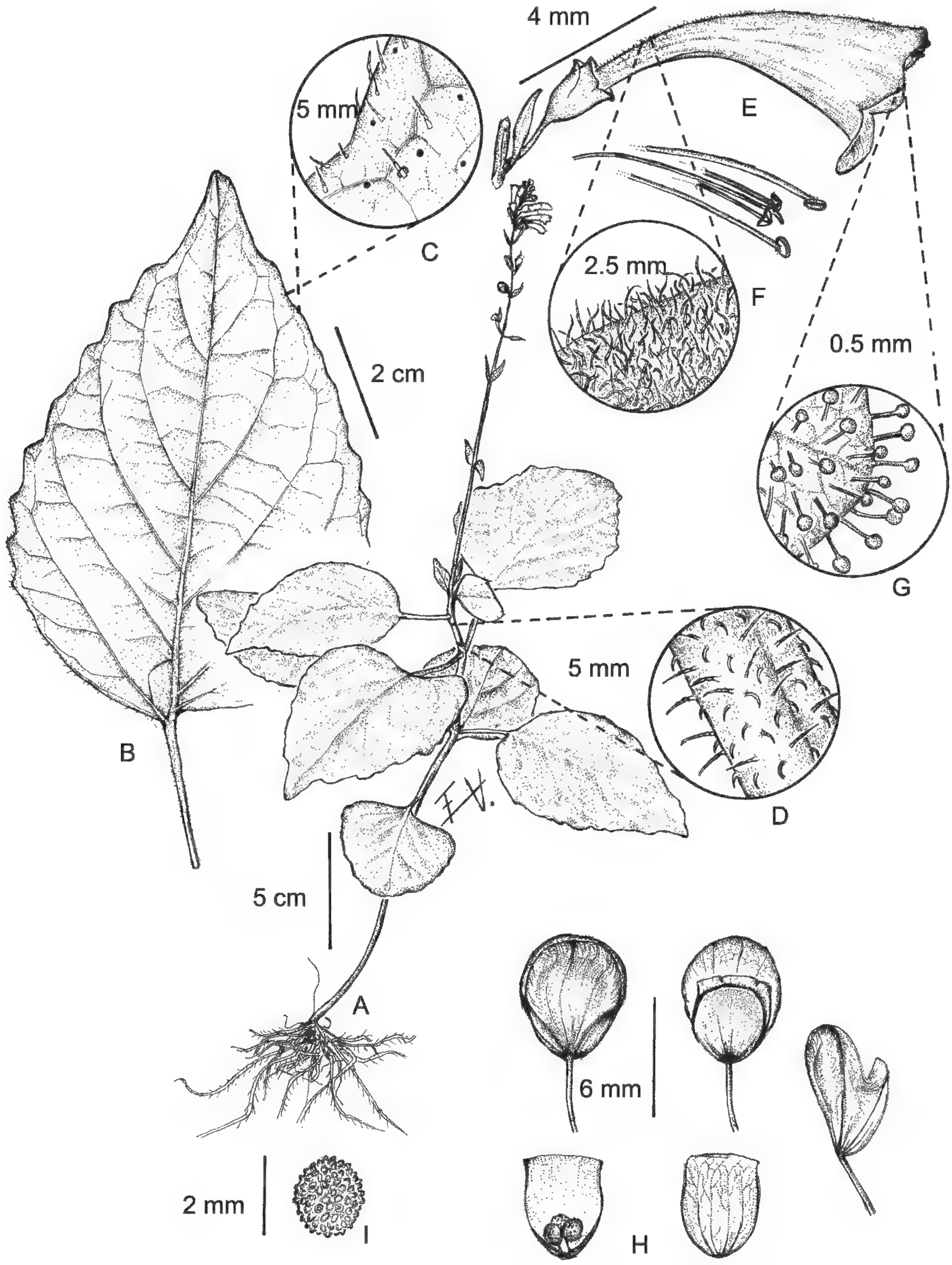

Figura 1. *Scutellaria sipilensis* Cuevas. —A. Planta completa. —B. Vista abaxial de la hoja. —C. Pubescencia del haz. —D. Pubescencia de la ramilla. —E. Flor. —F. Pubescencia de la parte externa de la flor, estambres y estilo. —G. Pubescencia de los ápices de los lóbulos de la corola. —H. Cáliz y escutelo en el fruto, de izquierda a derecha y de arriba hacia abajo corresponde a: vista abaxial y adaxial, vista lateral, corte longitudinal de la base del cáliz mostrando las nuececillas, complemento del corte de la base del cáliz. —I. Nuececillas. A–G del tipo, *Cuevas et al. 9161* (ZEA); H, I de *Iltis et al. 30995* (ZEA). En las figuras C, D, F y G, las medidas corresponden al diámetro del círculo.

1.5–2.5 mm, con frecuencia cubierto con el margen decurrente. Cáliz en la flor 3.8–4 × 2.5–3 mm (ancho en la boca), con un escutelo de 1.25 mm de alto, diminutamente estrigoso, tricomas 0.08–0.1 mm, glabro internamente; corola de color rojo escarlata, tubo con la gálea 15–17 mm de largo, densamente pubescente en el exterior, tricomas multicelulares 0.26–0.6 mm, con pelos glandulares en el ápice de los lóbulos 0.12–0.14 mm, glabra internamente; tubo notablemente curvado hacia arriba a los 2–3 mm de la base, 3.7–4.5 mm de ancho en la boca; labio inferior 2–4 mm, sin lóbulos laterales aparentes, obtuso a redondeado; labio superior galeado y protegiendo a los estambres, notablemente trilobado, el lobo central 1.25 mm, los lobos laterales 1–1.5 mm, obtusos; estambres didínamos, los dos más pequeños adnados al tubo de la corola a 11–14 mm arriba de la base, 2 mm más arriba que los estambre más largos,

barbados a la altura de la garganta, anteras 0.75 mm, glabras; cálix en el fruto 6–7 × 5–6 mm, glabro, escutelo, 3.2–3.5 × 5–6 mm, con el ápice recurvado; pedicelos 4–5 mm; nuececillas esféricas y comprimidas lateralmente, 1.5–1.7 mm diám., castaño claras, con tubérculos de 0.1 mm, glabras.

Distribución y ecología. *Scutellaria sipilensis* se conoce únicamente de dos localidades, en la costa sur del Estado de Jalisco, una en la base suroeste de la Sierra de Manantlán y la otra en el cerro El Sípil. Se le registra en altitudes de 420 a 1000 m, en bosque tropical subcaducifolio y en área abiertas dentro de esta comunidad vegetal, donde convive con *Heliconia mooreana* R. R. Sm., *Cecropia obtusifolia* Bertol., *Oreopanax peltatus* Linden ex Regel, *Ardisia revoluta* Kunth, *Barleria micans* Nees, *Annona purpurea* Moc. & Sessé ex Dunal, *Aphananthe monoica* (Hemsl.) J.-F. Leroy, *Casearia sylvestris* Sw. y *Pseudobombax ellipticum* (Kunth) Dugand, entre otras.

Categoría de la Lista Roja de UICN. De acuerdo con los criterios de la UICN (2001), *Scutellaria sipilensis* se cataloga En Peligro Crítico (CR), pues por observación directa se infiere que sus poblaciones han tenido una fuerte reducción y la calidad de su hábitat está siendo fuertemente modificado, su extensión superficial es menor a los 100 km², en las dos localidades, severamente fragmentadas, conocidas en el estado de Jalisco, se observa una disminución drástica de su hábitat por aprovechamiento selectivo de especies y ganadería extensiva. El tamaño poblacional no es mayor a 100 individuos y se infiere una disminución continua de las dos subpoblaciones conocidas, las cuales no tienen más de 50 individuos maduros cada una (CR A1ac; B1ab[iii,iv]; C2a[i]).

Fenología. Se ha recolectado con flores y frutos en noviembre y marzo.

Discusión. *Scutellaria sipilensis* por ser una hierba con tallos separándose con facilidad de la parte subterránea, con tricomas sobre la superficie y nervios del haz a glabrescentes, racimos con flores en espiral sobre las axilas de brácteas persistentes y su corola rojo escarlata y arqueada, encuentra acomodo en la sección *Cardinales* Epling (Epling, 1939; Pool, 1998) o en la sección *Scutellaria* y el grupo de especies "speciosa" de Paton (1990). Como ambas clasificaciones parecen ser insatisfactorias y un nuevo reacomodo se hace necesario a la luz de al menos 12 nuevas especies descritas en los últimos 12 años (Pool, 1998, 2006), seguimos el criterio de Pool (2006) de ubicar a la especie aquí propuesta en la sección *Cardinales* de Epling (1939) en un sentido práctico. La sección *Cardinales* presenta una distribución principalmente mesoamericana (Epling, 1942), con dos especies llegando hasta Venezuela y Colombia y *S. formosa* Leonard y *S. longifolia* Benth. (Leonard, 1927; Epling, 1942), marcando su límite de distribución norte en el estado de Guerrero y Veracruz, por lo que el hallazgo de *S. sipilensis* en el estado de Jalisco incrementa la distribución más norte conocida de la sección. Standley y Williams (1973) optaron por consignar a *S. glabra* Leonard como sinonimia de *S. longifolia*, para este estudio seguimos el concepto de Pool (1998) de considerar a las dos entidades y las diferencias se dan al hacer la comparación con *S. sipilensis*. *Scutellaria longifolia* tiene hojas lanceoladas, las brácteas son caducas, las corolas de color anaranjado, el tubo y la gálea 25–32 mm y el tubo recto a delicadamente sigmoide (Pool, 1998), mientras que *S. sipilensis* tiene hojas anchamente ovadas a suborbiculares, las brácteas son persistentes, la corola es rojo escarlata, el tubo y gálea 15–17 mm y el tubo curvado. *Scutellaria glabra* presenta hojas, tallos y cálices glabros, una corola de color rojo oscuro y sacciforme cerca de su base y las brácteas son caducas (Leonard, 1927; Pool, 1998). En *S. sipilensis* las hojas, tallos y cálices presentan tricomas, las brácteas son persistentes, y la corola es de color rojo escarlata y no sacciforme. En *S. saslayensis* A. Pool (Pool, 2006) las hojas son anchamente elípticas, con el haz glabro, el ápice cortamente agudo a obtuso, las inflorescencias 26–26.5 cm, las brácteas caducas, el escutelo 1.5–1.75 mm de alto, el tubo con la gálea 27–29 mm, el labio inferior de la corola 5.5–6 mm y el labio superior 5.5–7 mm, mientras que en *S. sipilensis* las hojas son anchamente ovadas a suborbiculares, el haz con tricomas en superficie y nervios, el ápice agudo a cortamente acuminado, las inflorescencias 5.5–19 cm, las brácteas persistentes, el escutelo 1.25 mm de alto, el tubo con la gálea 15–17 mm, el labio inferior de la corola 2–4 mm y el labio superior 1.25 mm. *Scutellaria rosei* Fernald, se describió de Sinaloa y fue colocada por Epling (1942) en la sección *Speciosae* Epling por las hojas con pubescencia igual y suave en ambas superficies, a pesar de ello esta especie tiene caracteres en común con *S. sipilensis*, pero se diferencian por lo siguiente: *S. rosei* tiene tricomas glandular-capitados en la inflorescencia, el cáliz hispiduloso y glandular-capitado, corola de color rojo púrpura, gálea con tubo de 25 mm y gálea de 7 mm, mientras que en *S. sipilensis* la inflorescencia no presenta tricomas glandular-capitados, el cáliz es diminutamente estrigoso sin pelos glandular-capitados, corola de color rojo escarlata, gálea con tubo 15–17 mm y gálea 2–2.25 mm.

Paratipo. MÉXICO. **Jalisco:** Mpio. Casimiro Castillo, 4 km NE de Casimiro Castillo, 2–4 km E del Zapotillo, en la base del cerro La Petaca, 19°38′20″N, 104°24 25′O, bosque tropical subcaducifolio perturbado, 420–500 m, 10 mar. 1992 (fl., fr.), *H. Iltis, L. Guzmán y B. Benz 30995* (IBUG, WIS, ZEA).

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Lectotypification and New Synonymy in *Quercus* subg. *Cyclobalanopsis* (Fagaceae)

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Abstract. The name *Quercus cambodiensis* Hickel & A. Camus (Fagaceae) is lectotypified herein. Based on morphological comparison and wild population observation, seven names within *Quercus* subg. *Cyclobalanopsis* (Oerst.) C. K. Schneid. (Fagaceae) are synonymized: *Q. patelliformis* Chun to *Q. asymetrica* Hickel & A. Camus; *Cyclobalanopsis yingjiangensis* Y. C. Hsu & Q. Z. Dong to *Q. brevicalyx* A. Camus; *Q. cambodiensis* Hickel & A. Camus, *Q. camusiae* Hickel & A. Camus, and *C. pachyloma* (Seemen) Schottky var. *mubianensis* Y. C. Hsu & H. W. Jen to *Q. langbianensis* Hickel & A. Camus; and *Q. subhinoidea* Chun & W. C. Ko and *Q. chingsiensis* Y. T. Chang to *Q. thorelii* Hickel & A. Camus.

Key words: Fagaceae, *Quercus*, subgenus *Cyclobalanopsis*.

Subgenus *Cyclobalanopsis* (Oerst.) C. K. Schneid. in *Quercus* L. (Fagaceae) consists of about 150 species (Huang et al., 1999). Their distribution is restricted to East and Southeast Asia, with 69 species (43 endemic) in China. Most are important components of Southeast Asia's broad-leaved evergreen forests (Huang et al., 1999). The rank status of *Cyclobalanopsis* is an arguable issue in the taxonomy of Fagaceae. Most taxonomists treat the name as a subgenus of *Quercus*, based on the homologous origin of imbricate scales and concentric lamellae on the fruit cupules (Camus, 1938; Barnett, 1944; Soepadmo, 1968; Menitsky, 1984; Govaerts & Frodin, 1998). *Cyclobalanopsis* has been recognized at generic rank by other taxonomists (Schottky, 1912; Brett, 1964; Huang et al., 1998, 1999). Both the *Flora Reipublicae Popularis Sinicae* (vol. 22) and the *Flora of China* (vol. 4) recognized *Cyclobalanopsis* at the generic level. Molecular phylogenetic studies support two main clades in the genus *Quercus*: one broader clade composed of the largely New World section *Lobatae* Loudon, *Quercus* s. str., and section *Protobalanus* (Trel.) A. Camus, and a second monophyletic clade of the two strictly Old World groups, subgenus *Cyclobalanopsis* and section *Cerris* Loudon, which lies sister to the New World clade (Manos et al., 1999, 2001; Oh & Manos, 2008). Herein, we adopt the subgeneric placement of *Cyclobalanopsis* and interpret *Quercus* at the generic level.

1. Quercus asymetrica Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 29: 601. 1923. TYPE: Vietnam. Tonkin: Khe-va, Hai-ninh, 27 Sep. 1919, *Casabianca s.n.* (holotype, P; isotype, P).

Quercus patelliformis Chun, J. Arnold Arbor. 28: 241. 1947, syn. nov. *Cyclobalanopsis patelliformis* (Chun) Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 45. 1993. TYPE: China. Guangxi: Nan-Lin, Kuei-Kai Shan, 16 Oct. 1933, *C. Wang 34658* (holotype, SYS not seen; isotype, A).

Distribution and habitat. *Quercus asymetrica* occurs in evergreen forests of Guangxi and Hainan provinces in China and also extends into Tonkin (Bac Ky), Vietnam.

Discussion. In the original description (Chun, 1947), *Quercus patelliformis* was characterized by highly connate, columnar styles and a somewhat

Table 1. Key diagnostic features for *Quercus asymetrica* and *Q. patelliformis*.

Characters	*Q. asymetrica*[1,2]	*Q. patelliformis*[1,2,3]
Leaf shape	ovate-lanceolate, base slightly asymmetrically rotundate	ovate-lanceolate, base asymmetrically rotundate
Leaf size (cm)	15–20 × 5–8	7–18 × 2.5–7
Leaf lateral venation	10 to 11 pairs	9 to 11 pairs
Teeth of the margin	serrate in the apical half	serrate in the apical half
Fruit cupule shape and size (length × diam., mm)	saucer-shaped, 8–9 × ca. 25	saucer-shaped, 6–10 × 20–30
Cupule coverage of acorn	1/3	1/3
Trichomes on external cupule surface	short gray sericeous	gray sericeous
Trichomes inside cupule wall	densely gray sericeous	densely gray sericeous
Number of concentric lamellae	8	8 or 9
Dentition of concentric lamellae on cupule	lobed tooth at basal 2 to 4 rings, upper ring entire	lobed tooth at basal 2 to 4(5) rings, upper ring entire
Acorn shape and size (length × diam., cm)	oblate, 2.2–2.4 × 2.5–2.6	oblate, (1.9–)2.1–2.5 × 2.4–2.8
Trichomes on external acorn surface	densely sericeous	densely sericeous
Style base	convex, densely pubescent	obvious convex, with dense pubescence
Seed scar	concave, ca. 2 cm diam.	concave, 1.8–2.2 cm diam.

[1] Observations from type materials.
[2] Observations from herbaria collections.
[3] Observations from living populations in the wild.

depressed hemispheric acorn borne in a shallow cup with a narrow rim, which differed from *Q. asymetrica* in the coriaceous leaves and the nonturbinate acorns. The original publication of *Q. asymetrica* (Hickel & Camus, 1923: 601) stated "Folia ovato-lanceolata, asymetrica, basi oblique rotundata, apice attenuate, coriacea, crassa," which seems otherwise consistent with *Q. patelliformis*.

We measured and compared key diagnostic features for accessible specimens of *Quercus patelliformis* and *Q. asymetrica* (Table 1). The results indicated both the sterile and fruiting features of the two species show no essential differences. The diagnostic features of the two species listed by Chun (1947) appear arbitrary. The leaves from the type of *Q. patelliformis* appear smaller (7–18 × 2.5–7 cm), but leaf size varies dramatically even on the same tree of *Q. patelliformis*. Considering the uniform characters of the sterile and fruiting material of *Q. asymetrica* and *Q. patelliformis*, we reduce *Q. patelliformis* to synonymy under *Q. asymetrica*.

Specimens examined. CHINA. **Guangxi:** Shangshi, *M. Deng 477* (KUN). **Hainan:** Baoting, *G. M. Lou 60170* (IBSC). VIETNAM. **Tonkin [Bac Ky]:** s. loc., *Chevalier 39634* (P).

2. Quercus brevicalyx A. Camus, Chênes Atlas 3: t. 347, f. 31–38. 1948. TYPE: Laos. Pu Bia, 2300 m, 13 Sep. 1932, *A. F. G. Kerr 21017* (holotype, P not seen; isotype, P).

Cyclobalanopsis yingjiangensis Y. C. Hsu & Q. Z. Dong, Acta Bot. Yunnan. 5: 341. 1983, syn. nov. *Quercus yingjiangensis* (Y. C. Hsu & Q. Z. Dong) Govaerts, World Checkl. Bibliogr. Fagales: 322. 1998. TYPE: China. Yunnan: Yingjiang, Su-Dian, Mo-lon-ho, 2500 m, 24 May 1980, *S. R. Yang 9* (holotype, SWFC; isotype, SWFC).

Distribution and habitat. *Quercus brevicalyx* is endemic to southwestern Yunnan Province, China, and Laos; it is found in mixed forests, at 1800–2500 m altitude.

Discussion. The original publication of *Cyclobalanopsis yingjiangensis* (Hsu & Sun, 1983) stated that this species is allied to *Quercus chrysocalyx* Hickel & A. Camus, but differed in its thinner and smaller leaves with rounded or broadly cuneate bases, deciduous and sparsely stellate pubescent abaxially, as well as in the subflattened cup. When we checked the type material, we found that the cupules of *C. yingjiangensis* and *Q. brevicalyx* are both saucer-shaped, with a flat base, 2–4 × 30–31 mm diam., with seven lamellae on the cupule wall and irregular teeth. Their acorns are subhemispheric to ovate-conical, with a flat base, glabrous, 25–30 × 20–25 mm diam., with a convex stylar base. Leaves in the two species are ovate-lanceolate, with the base slightly asymmetric and rounded, serrate, viridescent adaxially, but sparsely stellate-tomentose abaxially and later glabrate. In *Q. brevicalyx*, leaves range from 8–9 × 4–4.1 cm, with lateral veins in nine to 11 pairs; in *C. yingjiangensis*, leaves are 8–12 × 3–4 cm, with lateral veins in nine to 12 pairs. All key diagnostic features of the two species appear identical, and we therefore assign *C. yingjiangensis* to synonymy under *Q. brevicalyx*.

Specimens examined. CHINA. **Yunnan:** Xishuangbanna Nat. Reserve, Hui-yin-he, *Anonymous 2408* (SWFC).

3. Quercus langbianensis Hickel & A. Camus, Ann. Sci. Nat., Bot., ser. 10, 3: 382. 1921. TYPE: Vietnam. Annam [Trung Ky]: "massif dulangbian, Grand Piton, pres du village de Beneur," 1500–2000 m, 15 Feb. 1914, *A. Chevalier 30029* (holotype, P; isotypes, AAU, P).

Quercus cambodiensis Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 29: 600. 1923, syn. nov. *Quercus langbianensis* Hickel & A. Camus subsp. *cambodiensis* (Hickel & A. Camus) Menitsky, Novosti Sist. Vyssh. Rast. 13: 56. 1976. TYPE: Cambodia. "Mont. De Elephant, sol argileux tourbeu," 1000 m, *E. Poilane 215* (lectotype, designated here, P; isotypes, NY, P).

Quercus camusiae Trel. ex Hickel & A. Camus, Fl. Indo-Chine 5: 957. 1929, syn. nov. Replaced name: *Quercus geminata* Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat.: 599. 1923. *Cyclobalanopsis camusiae* (Trel. ex Hickel & A. Camus) Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 44. 1993. TYPE: Vietnam. Annam [Trung Ky]: "Pres de Nha-trang, massif de Honba," 1000–1500 m, 18–20 Sep. 1918, *A. Chevalier 38650* (holotype, P; isotype, P).

Cyclobalanopsis pachyloma (Seemen) Schottky var. *mubianensis* Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14: 84. 1976, syn. nov. *Quercus pachyloma* Seemen var. *mubianensis* (Y. C. Hsu & H. W. Jen) C. C. Huang, Guihaia 12: 303. 1992. TYPE: China. Guangxi: Mubian, 1000 m, 3 Dec. 1958, *Z. Q. Zhang 14033* (holotype, PE).

Distribution and habitat. *Quercus langbianensis* has a wide distribution on the Indochinese peninsula, from southeastern Yunnan and western Guangxi provinces in China into Vietnam and Cambodia. It is one of the dominant species in the broad-leaved evergreen forests in this area.

Discussion. In their original publication of *Quercus cambodiensis*, Hickel and Camus (1923) cited two specimens, *E. Poilane 215* and *E. Poilane 270*. Both were collected from the same location in Vietnam. Poilane's collections were mainly deposited in P, but *E. Poilane 270* was not found there. We also searched the other herbaria (A, B, BR, E, F, G, K, L, NY, P, PC, US) where E. Poliane's collections were possibly deposited, but we were unable to locate *E. Poilane 270*. *E. Poliane 215* consists of three specimens distributed in P and NY. All three had acorns attached to the specimens and their morphology is consistent with the description of Hickel and Camus (1923). Given these circumstances, we selected *E. Poilane 215* as lectotype for *Q. cambodiensis*.

Hickel and Camus (1923) established *Quercus geminata* [≡ *Q. camusiae* Trel. ex Hickel & A. Camus] based on an unnumbered collection by *A. Chevalier* from Vietnam ("Annam: pres de Nha-trang, massif de Honba, alt 1.000–1.500 metres"), but this name was a later homonym to *Q. geminata* Small (published in 1897). Hickel and Camus (1929) later published the replacement name *Q. camusiae* Hickel & A. Camus. This was followed with an italicized citation (Hickel & Camus, 1929: 957) as "*Q. geminata* Hickel & A. Camus in Bull. Mus. Paris (1923), p. 599 (non Small)" citing a specimen of A. Chevalier without a collection number, but with the same collection information as given for *Q. geminata* in 1923. Although Hickel and Camus (1929) did not clearly state the relationship of *Q. camusiae* and *Q. geminata*, this evidence supports the name *Q. camusiae* as a replacement name for *Q. geminata* Hickel & A. Camus. In Camus's (1938: 236) monograph, she cited the type specimen of *Q. camusiae* as *A. Chevalier 38650* from Vietnam and the detail of the collection information corresponded to that for *Q. geminata* and *Q. camusiae*. This suggests her effective lectotypification of the name *Q. camusiae* and that *Q. camusiae* and *Q. geminata* were published based on the same type, with *Q. camusiae* the replacement name for *Q. geminata*.

Menitsky (1984) placed *Quercus camusiae* as a synonym of *Q. langbianensis* subsp. *cambodiensis*. Xu and Ren (1993), however, regarded *Q. camusiae* as a distinct species, transferring it to the genus *Cyclobalanopsis* Oerst. Later, Hsu and Jen (1976) described a new variety, *Cyclobalanopsis pachyloma* var. *mubianensis*, distinguishing it by the shallower cupule that covered only one third of the acorn.

After detailed examination of the accessible specimens, including types, we found the leaves, cupules, and acorns of the synonymized three species to be closely similar to *Quercus langbianensis* (Table 2).

The key characters that Camus (1938) applied to subgrouping the taxon in *Quercus* subg. *Cyclobalanopsis* included the length of the styles and the percentage of the cupule covering the acorns. In her key to the species, Camus used styles either rather long or very long and weak to separate *Quercus* ser. *Semiserrata* A. Camus, which included *Q. langbianensis* and *Q. cambodiensis*, and *Quercus* ser. *Pachylomae* A. Camus, which included *Q. camusiae*. She noted that the cupules of *Q. langbianensis* covered half or less than half of the acorn body, differing from *Q. cambodiensis*, in which the cupule only covered one fourth to one fifth of the acorns. Our results revealed an inaccuracy in the series key to the species given by Camus (1938). In the type material, the fruits of *Q. camusiae* are immature, but the type materials of our synonymized species are mature, which would weakly support Camus's recognition of the species. From our field observations in Pinbian, in southeastern Yunnan Province in China, at altitudes from 1980 to 2000 m, we also found the length of the unripe and ripe acorns to gradually change. The young

Table 2. Comparison of key taxonomical characters of *Quercus langbianenis*, *Q. cambodiensis*, *Q. camusiae*, and *Cyclobalanopsis pachyloma* var. *mubianensis*.

Characters	*Q. langbianensis*[1,2]	*Q. cambodiensis*[1,2]	*Q. camusiae*[1,2,3]	*C. pachyloma* var. *mubianensis*[1,2,3]
Leaf size (length × width, cm)	5.8–15.5 × 2.3–5.2	6–14.5 × 2.5–5	8–15 × 3–5.5	9–12 × 2.5–4
Leaf lateral veins	11 to 14 pairs	8 to 11 pairs	12 to 14 pairs	12 to 15 pairs
Fruit cupule lamellae	8 or 9	8 or 9	7 or 8	8
Toothing of the concentric lamellae on cupule	lobed, toothed or irregularly denticulate	upper lamellae entire, the lower lamellae irregularly denticulate	upper lamellae entire, the lower lamellae irregularly denticulate	irregularly denticulate
Cupule size (length × diam., cm)	1.1–1.4 × 1.7–2.2	0.9–1.2 × ca. 1.8	1–1.5 × 1.5–2.2	1.3–1.5 × 1.4–1.7
Acorn shape	obovoid to oblong	subovoid to oblong	obovoid	obovoid
Acorn size (length × diam., cm)	2.1–3.1 × 1.5–1.7	1.2–3 × 1.3–1.8	ca. 2.2 × 1.2–1.7	ca. 2.1 × 1.5
Cupule coverage of acorn	1/4–1/3	1/3	1/3–1/2	1/3
Acorn scar diam. (cm)	1–1.1	0.8–0.9	ca. 0.8	ca. 0.9
Acorn base	flat, subconvex, or convex	flat	flat or subconvex	subconvex

[1] Observations from type materials.
[2] Observations from herbaria collections.
[3] Observations from living populations in the wild.

immature acorns are completely enclosed by the cupule; during later fruit development, however, the acorns are elongate, and at maturity the cupule covers from one fourth to one half of the acorn bodies. This cupule coverage is a developmental difference rather than a diagnostic feature.

Specimens examined. CHINA. **Guangxi:** Shangsi, *W. T. Tsang 24793* (SYS). **Yunnan:** Hekou, *Y. M. Shui 11296* (KUN). CAMBODIA. s. loc., *E. Poilane 2296h* (L). INDO-CHINA. s. loc., *A. Petelot 4848* (IBSC). VIETNAM. **Tonkin [Bac Ky]:** Sai-Wong-Mo-Shan, *W. T. Tsang 30338* (L). **Annam [Trung Ky]:** Mont Bani, *J. Clemens 3455* (P).

4. Quercus thorelii Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 29: 599. 1923. *Cyclobalanopsis thorelii* (Hickel & A. Camus) Hu, Bull. Fan Men. Inst. Biol. Bot. 10: 106. 1940. TYPE: Laos. "Maong-pun, from de Sam. Neua," 17 Sep. 1920, *E. Poilane 1902* (holotype, P; isotypes, IBSC, NY, P).

Quercus subhinoidea Chun & W. C. Ko, Acta Phytotax. Sin. 7: 39. 1958, syn. nov. *Cyclobalanopsis subhinoidea* (Chun & W. C. Ko) Y. C. Hsu & H. W. Jen ex Y. T. Chang, Acta Phytotax. Sin. 34: 339. 1996. TYPE: China. Hainan: Dongfang, Qichai village, 380–500 m, 26 Nov. 1956, *S. H. Chun 11329* (holotype, IBSC; isotype, IBSC). Figure 1.

Quercus chingsiensis Y. T. Chang, Acta Phytotax. Sin. 11: 258. 1966, syn. nov. *Cyclobalanopsis chingsiensis* (Y. T. Chang) Y. T. Chang, Acta Phytotax. Sin. 34: 339. 1996. TYPE: China. Guangxi: Jing-si, Biao-lin, 1 Sep. 1935, *S. P. Ko 55677* (holotype, IBSC; isotype, KUN).

Distribution and habitat. *Quercus thorelii* is found in dense forests in mountain valleys, to 500 m altitude in southwestern Yunnan, southwestern Guangxi, and Hainan provinces in China, and in Laos.

Discussion. The cupules and acorns of *Quercus thorelii*, *Q. subhinoidea*, and *Q. chingsiensis* are morphologically similar and share a bowl-shaped, apically incurved cupule that encloses most of the oblate acorn. Only the top of the acorn and style emerge from the cupule. The external cupule wall is covered with grayish yellow, shortly tomentulose trichomes, and the concentric rings of the basal half are mostly fused to the cupule wall, with only the rims free. Vegetatively, the young twigs and young leaves were densely grayish yellow tomentose, later glabrate. However, a gradual series of finer differences was reported in the literature among these species. The original publication of *Q. subhinoidea* (Chun & How, 1958: 39) noted this species was close to *Q. thorelii*, but differed in the young twigs covered with a yellow tomentum, the leaves with 16 to 22 pairs of lateral veins, and the shallower fruit cupule with eight concentric lamellae. This differed from *Q. thorelii* (Chun & How, 1958), which was observed to have glabrous young twigs, leaves with 15 to 16 lateral veins, and a longer cupule with additional lamellae (Chun & How, 1958). The original description of *Q. chingsiensis* (Chang, 1966) indicated the thin cupule wall and upper incurved concentric lamellae differed from *Q. thorelii*. Subsequently, in the *Flora of China*,

Figure 1. *Quercus subhinoidea* Chun & W. C. Ko collected from Changjiang, Hainan Province, China (voucher *M. Deng 556*, KUN), showing the infructescences attached to a current-year branch. Scale bar = 2 cm.

the fruit was indicated as maturing during the current year in *Q. thorelii* versus maturing on one-year-old branchlets in *Q. chingsiensis* as a diagnostic feature of the two species (Huang et al., 1999). However, these aspects confused rather than resolved the species boundaries. In order to clarify this, we examined all accessible materials of *Q. thorelii*, *Q. subhinoidea*, and *Q. chingsiensis*, and further studied the morphological variation of the populations of *Q. thorelii* and *Q. subhinoidea* in the wild.

Our first study site was in Yunnan, China, at an altitude of 560 m. We collected four specimens from different parts of a branch and 50 mature fruits (*M. Deng 559*, KUN) of *Quercus thorelii* to discriminate key characters. Our second field site was in Hainan Province, China, at 500 m (*M. Deng 555*, *556*, *776*, *777*, KUN), corresponding to the type locality for *Q. subhinoidea*. Key taxonomic features are compared in Table 3, which shows that most attributes did not essentially differ among the three species. The acorn size of *Q. chingsiensis* seems smaller and flatter than *Q. thorelii* and *Q. subhinoidea*, but the type material of *Q. chingsiensis* was collected in September, while *Q. thorelii* and *Q. subhinoidea* mostly fruit from October to November. It is postulated that the flat acorns in *Q. chingsiensis* represent an immature stage and that these acorns correspond with those seen in *Q. thorelii* and *Q. subhinoidea*. Both morphology and phenology of the three species are similar, and therefore *Q. subhinoidea* and *Q. chingsiensis* synonymize under *Q. thorelii*.

Specimens examined. CHINA. **Guangxi:** Shang-si, *C. C. Chang 12455* (IBSC). **Hainan:** Changjiang, *M. Deng 555*, *556*, *776*, *777* (KUN). **Yunnan:** Mengyan, *M. Deng 559* (KUN).

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Table 3. Morphological comparison of *Quercus subhinoidea*, *Q. thorelii*, and *Q. chingsiensis*.

Characters	*Q. subhinoidea*[1,2,3]	*Q. thorelii*[1,2,3]	*Q. chingsiensis*[1,2]
Young twig and leaf	grayish yellow tomentose	golden woolly vestiture	NA
Mature leaf, adaxial surface	glabrous and shiny	glabrous and shiny	glabrous and shiny
Leaf size (length × width, cm)	6–15 × 3–6	9–17 × 3–6	8–10 × 3–5
Leaf lateral vein	15 to 21(22) pairs	(11)12 to 19(20) pairs	11 to 13(14) pairs
Venation type	semicraspedodromous	semicraspedodromous	semicraspedodromous
Fruit cupule size (length × diam., cm)	1.1–1.4 × 2.4–2.9	1.2–1.8 × 2–3.1(–3.3)	ca. 1 × 2.2
Cupule coverage of acorn	3/4 to entire acorn	3/4 to entire acorn	entire acorn
Cupule wall thickness (mm)	1.1–3(–3.5)	1.5–3(–5)	2.2–3
Acorn size (length × diam., cm)	1.4–1.7 × 1.8–2.4	1–1.5 × 2.1–2.8	ca. 0.7 × 2.5
Style base	concave or flat	concave or flat	concave
Acorn scar diameter and shape	1.3–1.8 cm, flat or subconvex	1.3–1.8(–2) cm, flat or subconvex	1.8–2 cm
Fruiting habit	fruit matures in current year; late Sep.–Nov.	fruit matures in current year; early Oct. to late Nov.	fruit matures in current year

NA, not available.
[1] Observations from type materials.
[2] Observations from herbaria collections.
[3] Observations from living populations in the wild.

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Strobilanthes biocullata (Acanthaceae), a New Species from Hunan, China

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ABSTRACT. A new species of Acanthaceae, *Strobilanthes biocullata* Y. F. Deng & J. R. I. Wood, from China, is described and illustrated. The species is found in Hunan, Guangxi, and Guangdong provinces, where it grows on rocks along streams. It clearly belongs to the group of species placed by Bremekamp in *Semnostachya* Bremek., but differs from all these by two swollen bulges on the dorsal surface of the long-acuminate bracts. *Strobilanthes biocullata* is the first Chinese species of *Strobilanthes* Blume reported to have a plietesial life history.

Key words: Acanthaceae, China, plietesial, *Strobilanthes*.

During botanical exploration in Hunan Province, China, a very distinctive new species of *Strobilanthes* Blume was found on rocks along streams (Fig. 1A). It is immediately distinguished from other species by the two swollen bulges on the dorsal surface of the bracts (Fig. 2D). This is another new species in the largest genus of Acanthaceae in China (Hu & Tsui, 2002; Deng et al., 2006), which has been identified during the course of revision of *Strobilanthes* for the forthcoming volume of *Flora of China* (Wood & Scotland, 2003b; Chen et al., 2006; Deng et al., 2006, 2007; Deng & Xia, 2007; He & Qin, 2007).

Strobilanthes biocullata Y. F. Deng & J. R. I. Wood, sp. nov. TYPE: China. Hunan: Yuanling Xian, Jiemuxi Natural Reserve, Jiemuxi Cun, 750 m, on rock beside a stream, 12 July 2008, *Deng Yunfei 20741* (holotype, IBSC; isotypes, CAS, FHO, MO). Figures 1, 2.

Haec species quoad flores in spicas axillares efoliatas dispositos, corollam flexam glabram et grana pollinis prolata pseudocolpata ordinatione scalariformi ornata *Strobilanthis compactae* D. Fang & H. S. Lo et omnium specierum ad *Semnostachyam* Bremek. ascriptorum manifeste affinis, sed ab eis sicut congeneris omnibus bracteis tumoribus duobus elevatis dorsaliter instructis valde distincta.

Gregarious anisophyllous undershrub, 0.8–2 m tall. Stems subterete, bisulcate, glabrous. Leaves unequal in each pair, the smaller about half the size of the larger; petioles 1–5 cm, glabrous, sulcate; blades oblong-elliptic to elliptic, the larger 13–26 × 4–8 cm, the smaller 6–12 × 2–4 cm, glabrous, densely covered with cystoliths on both surfaces, apex acuminate, margin serrate, base narrowly cuneate, lateral veins 5 to 10 pairs, prominent on both surfaces, tertiary veins prominent. Spikes solitary, axillary, simple, leafless, (3–)7–10 cm (Fig. 1C); rachis glabrous, flowers in opposite pairs (occasionally single), the pairs 1–2 cm apart on the rachis. Bracts ovate, 3.5–5 × 2.5–3 mm, glabrous, apex long-acuminate to mucronate, the dorsal surface with 2 swollen bulges resembling eyes; bracteoles ovate-oblong, ca. 4 × 2 mm, glabrous, apex acuminate to mucronate, somewhat fragile and caducous. Calyx 1–1.2 cm, sparsely pubescent when young, glabrescent, subequally 5-lobed almost to the base, lobes lanceolate, apex long-acuminate, yellowish brown, 1-nerved. Corolla purplish blue, 3.5–4 cm, outside glabrous, inside glabrous except for hairs retaining the styles, basal tube cylindrical for 6–11 mm, ca. 3 mm wide, then bent to ca. 90° and gradually widened to ca. 2 cm at mouth, subequally 5-lobed, lobes ovate, ca. 4 × 7 mm, apex emarginate. Stamens 4, didynamous, included (Fig. 1D); filaments

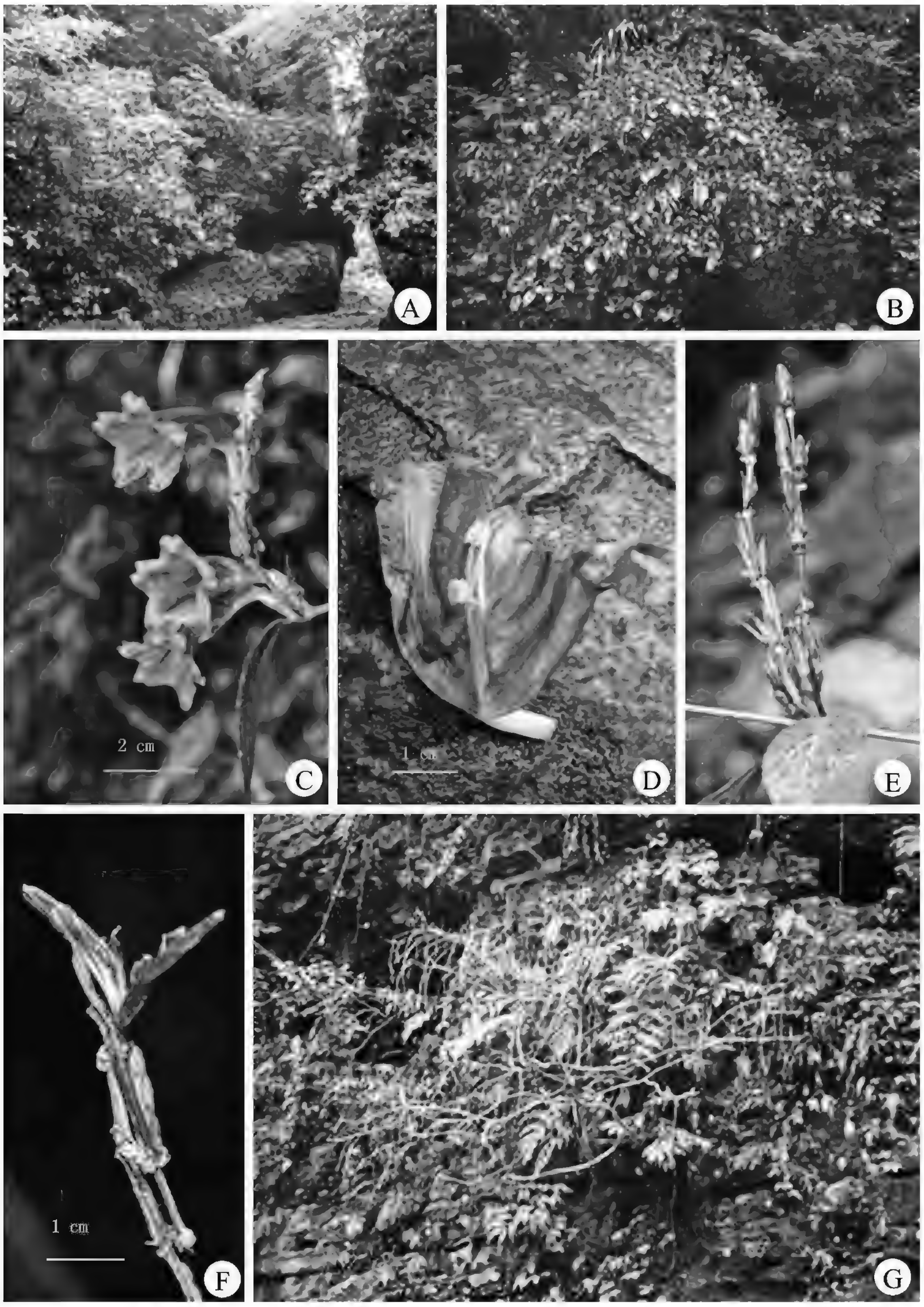

Figure 1. *Strobilanthes biocullata* Y. F. Deng & J. R. I. Wood. —A. Habitat. —B. Flowering plant. —C. Flowering spike. —D. Corolla opened up to show stamens. —E. Fruiting spike. —F. Open capsule. —G. Dead plants after flowering.

pilose, the longer pair ca. 1 cm long, the shorter pair ca. 0.3 cm long; anthers oblong, ca. 3 × 1.2 mm; pollen prolate, tricolporate, bireticulate, pseudocolpi 12, scalariform, 64.9 × 36.9 μm, polar axis (P):equatorial diameter (E) = 1.76 (Fig. 3). Ovary glabrous, ca. 3 mm; style ca. 2.8 cm. Capsule clavate, 1.5–2 cm, glabrous, 4-seeded; seeds lenticular, ca. 3 × 3 mm, densely appressed-pubescent, areole small (Fig. 2L).

Figure 2. *Strobilanthes biocullata* Y. F. Deng & J. R. I. Wood. —A. Flowering branch. —B. Leaf blade, adaxial (left) and abaxial (right) surfaces. —C. Tip of inflorescence. —D. Bract. —E. Bracteole. —F. Calyx, ovary, and style. —G. Corolla. —H. Corolla opened showing stamens. —I. Anther. —J. Stigma. —K. Capsule. —L. Seed. Drawing by Liu Yunxiao. A–J from *Deng Yunfei 20741* (IBSC), K–L from *Huang Hongquan s.n.* (IBSC).

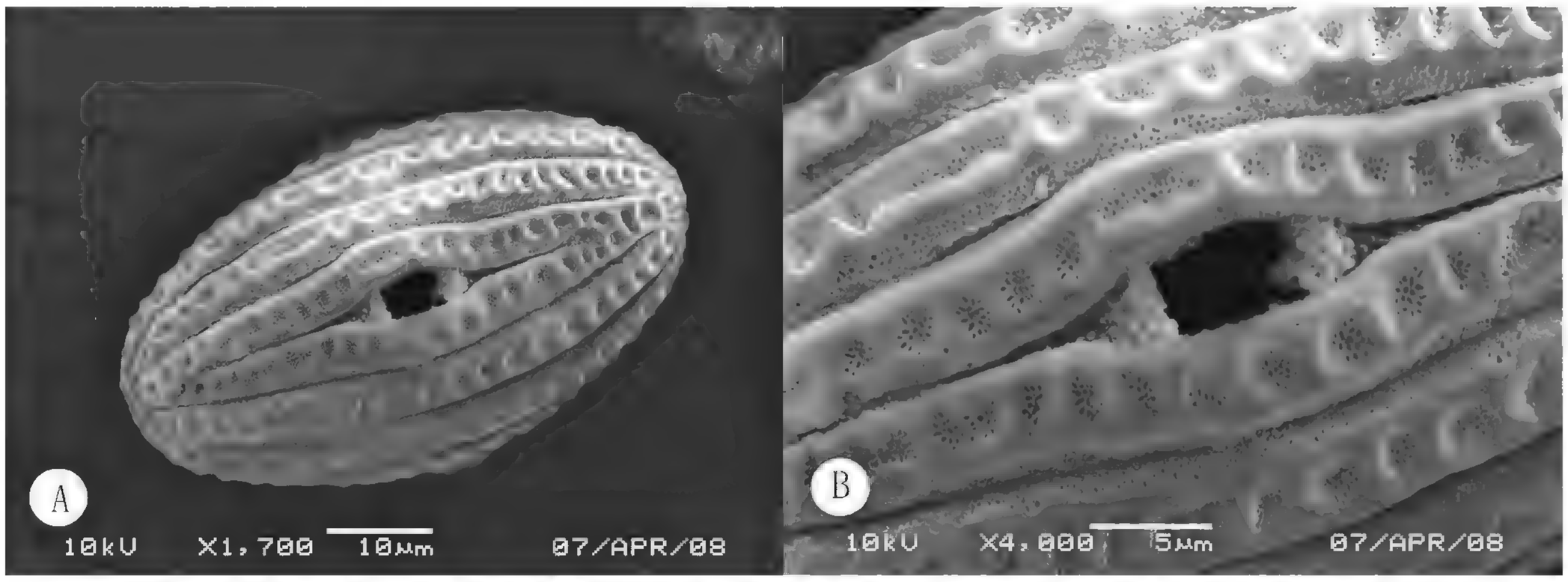

Figure 3. SEM images of pollen of *Strobilanthes biocullata* Y. F. Deng & J. R. I. Wood from *Deng Yunfei 19835* (IBSC). —A. Pollen grain. —B. Aperture.

Distribution, habitat, and ecology. *Strobilanthes biocullata* is endemic to China, occurring in Hunan, Guangdong, and Guangxi provinces. It was found in the Wulingshan and Western Nanling ranges. It grows on moist rocks along streams at altitudes of 200–800 m.

IUCN Red List category. *Strobilanthes biocullata* is not common, occurring in six isolated, small populations. It is probably not threatened and might be considered Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001).

Phenology. The new species is known to flower in July–September and to fruit in October–December.

Etymology. The specific epithet is derived from the Latin "bi-," meaning "two," and "ocullatus," meaning "with eyes," because this species can be easily distinguished from other species by its bracts, which have two extrorsely swollen bulges resembling eyes.

Discussion. *Strobilanthes biocullata* clearly belongs to the group of species placed by Bremekamp in the genus *Semnostachya* Bremek., which is exceptionally well represented in South China with some 14 species including *Strobilanthes longispicata* Hayata, *S. cystolithigera* Lindau, *S. abbreviata* Y. F. Deng & J. R. I. Wood, *S. guangxiensis* S. Z. Huang, *S. myura* Benoist, *S. longzhouensis* H. S. Lo & D. Fang, and *S. compacta* D. Fang & H. S. Lo. All species in this informal group have an inflorescence of leafless axillary spikes, which are sometimes aggregated into panicles; a calyx subequally 5-lobed to near the base; a corolla that is externally glabrous and strongly bent; and pollen that is always prolate, tricolporate, and bireticulate with scalariform patterning. This group of species is unusual in *Strobilanthes* because of the development of unusual structures on the dorsal surface of the bracts in some species. These structures include rigid, scabrid hairs in the Philippine species *S. halconensis* Merr. and *S. cincinnalis* C. B. Clarke, sessile glands in *S. abbreviata* (Deng et al., 2006: 377–379), and the paired swollen bulges in the new species; this character noted for *S. biocullata* is unique not only within this species group but within the whole of *Strobilanthes*. *Strobilanthes biocullata* is perhaps most similar to *S. compacta*, but is easily distinguished from the latter by the distant, not imbricate, flowers on the spikes and the distinctive bracts (Luo et al., 1997).

In 2001, the first author collected this plant from Xinning Xian in Hunan Province (*Deng Yunfei 16065*) and found that all of the plants were dead the next year when he visited the site again. In 2008, however, the plants flowered again (*Deng Yunfei 20773*). It was reported that the plants never flowered between 2001 and 2007, so it seems that this species is flowering in 7- to 8-year cycles. This, therefore, is the first concrete evidence of a plietesial life history in *Strobilanthes* in China. Further evidence is provided by observations from another site where this species grows, Jiemuxi, Yuanling Xian in Hunan Province. Here Deng and Fu collected specimens in both 2007 and 2008. They found that plants that flowered in 2007 died after flowering, while those flowering in 2008 had not been in flower in 2007.

Plietesial species grow for many years, flower gregariously, and then die, in much the same manner as bamboo (Fuller, 1925; van Steenis, 1942; Janzen, 1976; Wood, 1994a; Daniel, 2006). This kind of life history is known from several families, but is best documented in the Bambusoideae (Poaceae) and Acanthaceae. In Acanthaceae, the phenomenon has been reported in at least five genera: *Strobilanthes*, *Isoglossa* Oerst. (Clarke, 1901; Tweedie, 1976; van Steenis, 1978; Poriazis & Balkwill, 2008), *Acantho-*

pale C. B. Clarke (Bergsdorf, 2006), *Mimulopsis* Schweinf. (Dale & Greenway, 1961; Tweedie, 1965), and *Stenostephanus* Nees (Daniel, 2006). Within *Strobilanthes* it was first noted more than 170 years ago when Nees (1836) described *S. sexennis* based on Walker's comment that this Sri Lankan species flowered every six years (Wood, 1994b: 110–111). Since then, this phenomenon has been reported from many other countries including Indonesia, Thailand, Myanmar (Burma), Bhutan, and India (Trimen, 1895; Kanjilal, 1901; Gamble, 1902; Parker, 1924; Osmaston, 1927; Robinson, 1935; van Steenis, 1942, 1985; Bremekamp, 1944; Bowden, 1950; Matthew, 1970; Biswas, 1975; Wood, 1994a, 1998; Carine, 1997; Scotland, 1998; Bennett & Hansen, 2000; Carine & Scotland, 2000; Carine et al., 2000; Garbyal, 2000; Wood & Scotland, 2003a: 84, 2009: 39; Wood et al., 2003). It is probable that many species of *Strobilanthes* from China are plietesial, but this is the first confirmed example, although Hu and Tsui (2002) suggested *S. tomentosa* (Nees) J. R. I. Wood (as *Aechmanthera tomentosa* Nees) might be plietesial.

Paratypes. CHINA. **Guangdong:** Lechang Shi, Pingshi Zhen, Jinjishan, 4 Nov. 1986, *Exped. Nanling 3462* (IBSC); Lechang Shi, Shaping Gongshe, Laixiage, July 1969, *Luo Xianrui s.n.* (IBSC). **Guangxi:** Linchuan Xian, Qifenshan, 1–11 Oct. 1937, *W. T. Tsang 28470* (A, SYS); Linchuan Xian, Chaotian Xiang, Qifenshan, 25 June 1952, *Liang Choufen 30425* (IBK); Xing'an Xian, Huajiang Qu, Ruilian to Chetan, 12 June 1953, *Exped. Guangxi 1170* (KUN, PE). **Hunan:** Xinning Xian, Mishaizhai, 450 m, 14 Sep. 1985, *Luo Yibo 3390* (PE); Xinning Xian, Langshan, Zixiadong, 25 Aug. 2001, *Deng Yunfei 16065* (IBSC); Xinning Xian, Langshan, Zixiadong, 400 m, 1 Aug. 2008, *Deng Yunfei 20773* (IBSC); Yuanling Xian, Jiemuxi, 750 m, 16 Sep. 2007, *Deng Yunfei with Fu Ying 19835* (IBSC); Yuanling Xian, Leyixi, 200 m, 13 July 2008, *Deng Yunfei with Fu Ying 20752* (IBSC); Zhangjiajie, Yongding Qu, Tianmenshan, Laodaoxi, ca. 300 m, June 2008, *Huang Hongquan s.n.* (IBSC); Zhangjiajie Shi, Yongding Qu, Tianmenshan, Laodaoxi, ca. 300 m, 10 July 2008, *Deng Yunfei 20740* (IBSC).

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Zygella S. Moore, a Synonym of *Larentia* Klatt (Iridaceae)

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Abstract. The identity of *Zygella* S. Moore, a genus of Iridaceae of Mato Grosso, Brazil, has never been satisfactorily established. Plants described by S. M. Moore in 1895 as *Zygella graminea* appear to us to be conspecific with *Larentia linearis* (Kunth) Klatt, type species of *Larentia* Klatt, a plant well represented in herbaria, mostly from grasslands of Venezuela. We reduce *Zygella* to synonymy in *Larentia*, and *Z. graminea* becomes a synonym of *L. linearis*. A second species, *Z. mooreana* Hoehne, described in 1910 and also from Mato Grosso, is likewise conspecific with *L. linearis* and a lectotype is designated for that species. *Cypella mexicana* C. V. Morton & R. C. Foster, which shares the characters of *Larentia*, is transferred to the genus as *L. mexicana* (C. V. Morton & R. C. Foster) Goldblatt; with this addition, *Larentia* now includes three species.

Key words: Brazil, Iridaceae, *Larentia*, Mato Grosso, Tigridieae, Venezuela, *Zygella*.

The genus *Zygella* was described by S. M. Moore in 1895 for a species of Iridaceae collected in Mato Grosso in interior Brazil two years previously, and at the time consisted of only one species, *Z. graminea* S. Moore. Both genus and species appear to have been overlooked by systematists dealing with the Iridaceae of South America and have remained, at least technically, recognized until now. The characteristics of *Zygella* include a bulbous rootstock; linear, unifacial leaves with pleated blades; and an inflorescence of the *Iris*-type, a rhipidium, enclosed in a pair of large opposed leafy bracts. The flowers have three free stamens with the anthers appressed to narrow, compressed style branches that each bear a pair of small crests, below which lies a bilobed stigmatic lip. These features place the genus squarely in tribe Tigridieae of subfamily Iridoideae (Goldblatt, 1990), an exclusively New World tribe of some 15 genera and over 175 species (Goldblatt & Manning, 2008; Goldblatt et al., 2008).

Illustrations accompanying the protologue show a plant with a branched stem; a distinctive, narrow, attenuate leaf subtending the lowermost branch; narrow rhipidia with the outer spathe about half as long as the inner; and flowers with subequal, laxly spreading, unmarked tepals. *Zygella mooreana* Hoehne (Hoehne, 1910), also from Mato Grosso, is evidently conspecific with *Z. graminea*, but the illustrations of the flowers in Hoehne's publication are more carefully drawn and show the tepals to be markedly clawed, with the narrow claws and limb bases darkly speckled. The illustrations and type specimen at the Natural History Museum, London, are a close match to the Venezuelan *Larentia linearis* (Kunth) Klatt (Klatt, 1882). We have not been able to locate the syntypes of *Z. mooreana*. Differences in the flowers illustrated in Moore's and Hoehne's publications are probably not significant. More likely those in the former illustration are simply poorly rendered, perhaps because they were drawn from dried flowers revived in water, whereas the latter appears to have been drawn from life.

Larentia Klatt (Klatt, 1882) was described with the single species *L. linearis* of grassland habitats of Venezuela. The genus was included in *Cypella* Herb., a genus mainly (possibly exclusively) of temperate South America, by Baker (1892), now including ca. 30 species. The American specialist of the systematics of New World Iridaceae, R. C. Foster (1945), followed Baker's taxonomy in this instance. In contrast, Ravenna (1977) regarded *Larentia* as separate from *Cypella* and added one species, *L. rosei* (R. C. Foster) Ravenna, to the genus. A molecular study using five plastid DNA regions (Goldblatt et al., 2008) shows one species of *Larentia*, *L. rosei*, and the very similar *C. mexicana* C. V. Morton & R. C. Foster, no doubt correctly a species of *Larentia*, to be sister to *Cipura* Aubl. and not immediately allied to *Cypella*, a result that justifies Ravenna's recognition of *Larentia* as separate from *Cypella*. We infer that *L. linearis* plus two Mexican species, *L. rosei* and *C. mexicana* (here

transferred to *Larentia*), constitute a genus sister to *Cipura*. Rodriguez and Sytsma (2006), using both nuclear and chloroplast genes, likewise showed *Larentia* sister to *Cipura* (using *L. rosei* as *C. rosei* R. C. Foster), but their study did not include any true *Cypella* species; their analysis thus provides no evidence directly relevant to this discussion. *Larentia* now includes three species.

For the reasons outlined above, Goldblatt and Manning (2008) followed Ravenna in recognizing *Larentia*, pending a more extensive molecular systematic analysis of Tigridieae. We therefore reduce *Zygella* to synonymy in *Larentia*. We also refer two species of *Zygella* to *L. linearis*. Until now it has not been clear in the literature that *L. linearis* occurs in Brazil, but apart from the collections included in the two species of *Zygella*, we have found specimens identified as *L. linearis* from Brazil, e.g., *Hatschbach 33300* (MO) from Goias, and several more. The Brazilian plants seem to us in no way different from those from Venezuela. Location of the type material of Hoehne's *Z. mooreana* remains problematic, as it has not been located at SP where expected. For this reason, we have chosen a lectotype for the species, the illustration accompanying the protologue.

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Zygella S. Moore, Trans. Linn. Soc. London, Bot., ser. 2, 4: 493. 1895, syn. nov. TYPE: *Zygella graminea* S. Moore (= *Larentia linearis* (Kunth) Klatt).

Larentia linearis (Kunth) Klatt, Abh. Naturf. Ges. Halle 15: 362. 1882. Basionym: *Moraea linearis* Kunth, in Humb., Bonpl. & Kunth, Nov. Gen. Sp. (quarto ed.) 1: 321. 1815 [1816]. TYPE: Venezuela. "Crescit in humidis calidisque Guayanae prope El Trapiche de Farreras," June, *Humboldt & Bonpland s.n.* (type, P).

Zygella graminea S. Moore, Trans. Linn. Soc. London, Bot., ser. 2, 4: 494. 1895, syn. nov. TYPE: Brazil. Mato Grosso: Santa Cruz, *S. Moore 993* (holotype, BM).

Zygella mooreana Hoehne, Commiss. Linhas Telegr. Estratég. Matto Grosso Amazonas 1: 19. 1910, syn. nov. TYPE: Brazil. Mato Grosso: Porto Esperidiao (lectotype, designated here, fig. 58 in Hoehne, 1910).

Larentia mexicana (C. V. Morton & R. C. Foster) Goldblatt, comb. nov. Basionym: *Cypella mexicana* C. V. Morton & R. C. Foster, Contr. Gray Herb. 171: 22. 1950. TYPE: Mexico. Guerrero: Montes de Oca, 15 June 1937, *G. Hinton et al. 10322* (holotype, US; isotypes, GH, MO, NY).

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A New Xeromorphic Species of *Clusia* (Clusiaceae) from Dry Valleys of Northern Peru

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Abstract. *Clusia magnoliiflora* M. H. G. Gust. is described as new for the Clusiaceae. It grows in dry scrub in the river valleys of the Marañón and its tributaries in northern Peru, a kind of habitat that harbors very few *Clusia* species. The species is distinct on account of its extremely thick, obovate leaves; the large, white flowers with as many as seven or eight spatulate petals; the large, white, triangular stigmata in the flower; and the spherical fruit with the stigmata positioned well below the apex. *Clusia magnoliiflora* is abundant in the habitat where it was collected.

Key words: *Clusia*, Clusiaceae, IUCN Red List, Marañón valley, Peru, Retinostemon group.

The Neotropical genus *Clusia* L. (Clusiaceae) comprises terrestrial, hemiepiphytic, and epilithic trees and shrubs. Most species are either hemiepiphytes in lowland rainforests or terrestrial trees or shrubs in wet montane forests, while only a few occur in arid areas. A distinctive species in the last category, found in dry valleys in northern Peru, is here described as new.

Clusia magnoliiflora M. H. G. Gust., sp. nov. TYPE: Peru. Amazonas: Marañón valley, on rd. to Lonya Grande 35 km from main rd. Bagua Grande–Chamaya, 6°2.0′S, 78°36.5′W, 600 m, 9 July 2002, *M. H. G. Gustafsson 544* (holotype, AAU; isotype, USM). Figures 1, 2.

A speciebus *Clusiae* L. notis foliis obovatis crassisimmis, floribus grandibus petalis albis spatulatis usque ad 7 vel 8 et capsula sphaerica stigmatibus peltatis dissitis infra apicem positis distinguitur.

Dioecious shrub or tree to 4 m tall; latex yellow; branches terete, somewhat succulent, with constrictions at the nodes. Leaves obovate, to 2 mm thick, petiole 8–14 mm, lamina 55–115 × 25–46 mm, cuneate at base, venation often obscure but sometimes visible abaxially, of 6 to 8 secondary veins at an angle of ca. 20°–30°, sparsely branched distally; laticifers visible on fresh leaves or on young, dried leaves as ± straight, thin, dense lines (white when fresh, blackish when dried) on adaxial surfaces, occasionally branched or anastomosing; angles very steep. Inflorescences of staminate plants 3- to 5-flowered, of pistillate plants 3-flowered; flowers to 9 cm diam., fragrant; bracteoles in 4 pairs, thick, decussate; sepals 5, orbicular, 12–16 mm, somewhat petaloid; petals 7 or 8, white, spatulate, concave, 26–38 × 17–25 mm, caducous in fruit; staminate flowers with a white, rounded to octagonal synandrium, 12–18 mm wide, covered with yellow resin at anthesis; anthers ca. 80 to 120, sessile, mostly dithecal, 1.5–2.5 × 1.5–2.5 mm, opening with 2 longitudinal slits; stigmata 9, white, irregularly triangular, 4–5 × 4–5 mm, peltate, on styles < 1 mm long; staminodial ring whitish, 1.5–3 mm tall, crowned by 12 to 16 resiniferous antherodes, ca. 1 × 2–3 mm. Fruit globular (immature fruit measured at 25 mm) with black, peltate, widely spaced stigmata, positioned well below the apex; petals caducous in fruit.

Distribution and habitat. *Clusia magnoliiflora* occurs in large populations in parts of the Chinchipe river valley and in adjacent parts of the Marañón river valley, where it grows in dry scrub at between 500 and 1200 m altitude (Fig. 2E, F). Other elements in this vegetation include cacti, such as species of *Melocactus* Link & Otto, and shrubs, such as *Croton* L.

IUCN Red List category. Given the large populations distributed over a relatively large area, the species appears not to be threatened and is assessed here as Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001). Some of the localities are intensively grazed by goats, which certainly have a strong impact on the vegetation. This probably does not, however, negatively affect the stands of *Clusia magnoliiflora*, as the animals apparently avoid them.

Etymology. The specific epithet refers to the similarity of the flowers, when seen from a distance, to certain species of *Magnolia* L.

Local names and uses. According to residents of Lonya Grande (July 2002), the dried latex of *Clusia magnoliiflora* is used as incense in churches, and the

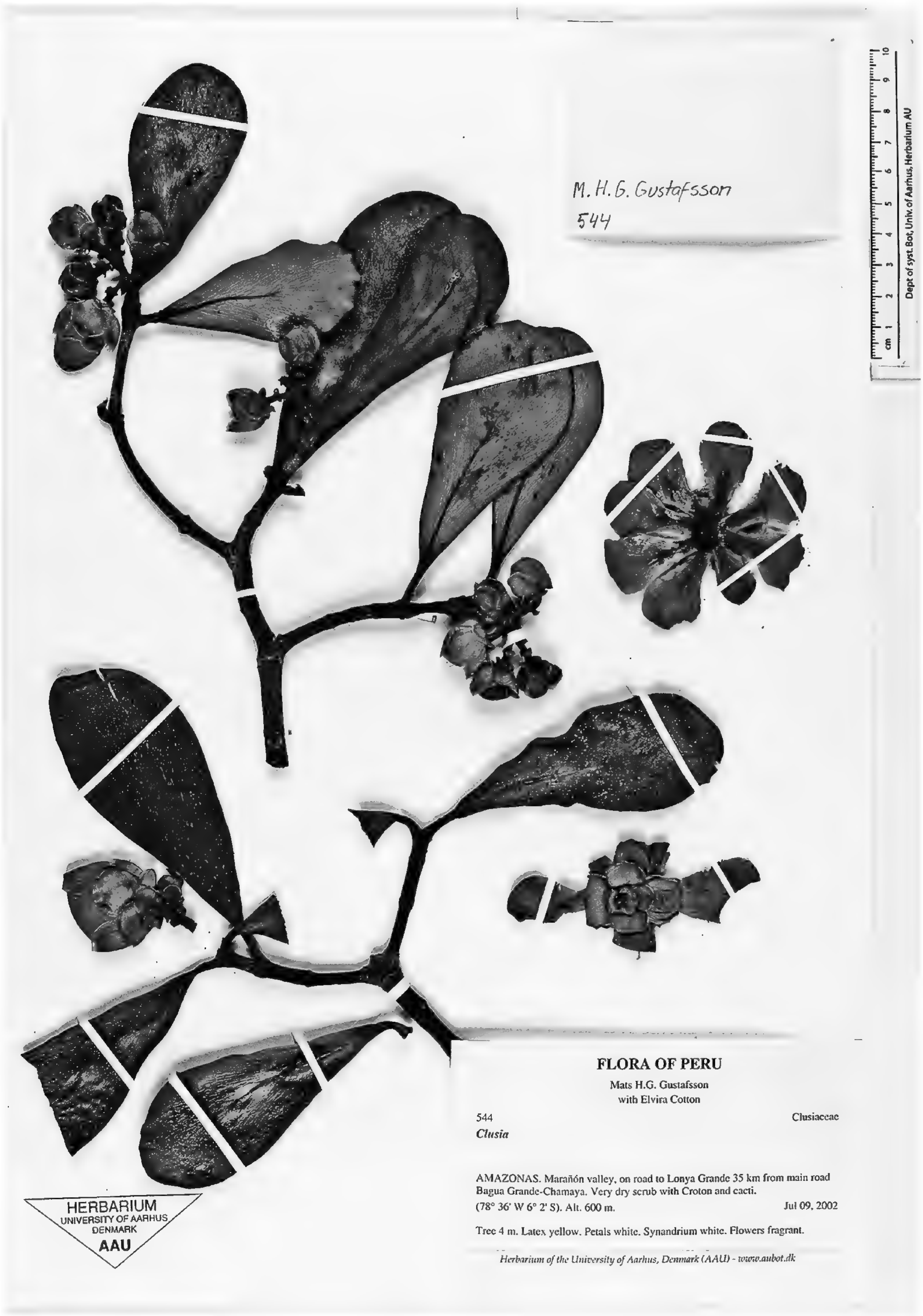

Figure 1. Type specimen of *Clusia magnoliiflora* M. H. G. Gust. (*Gustafsson 544*, AAU).

fruit is cut and applied to wounds to improve healing. The local name is "tola blanca."

Discussion. *Clusia magnoliiflora* has exceptionally thick leaves, and its xerophytic character is also evident in the $^{13}C/^{12}C$ signature, which shows an extreme value for *Clusia* (K. Winter & M. H. G. Gustafsson, unpublished). This indicates pronounced crassulacean acid metabolism (CAM) photosynthesis, which in *Clusia* is otherwise seen predom-

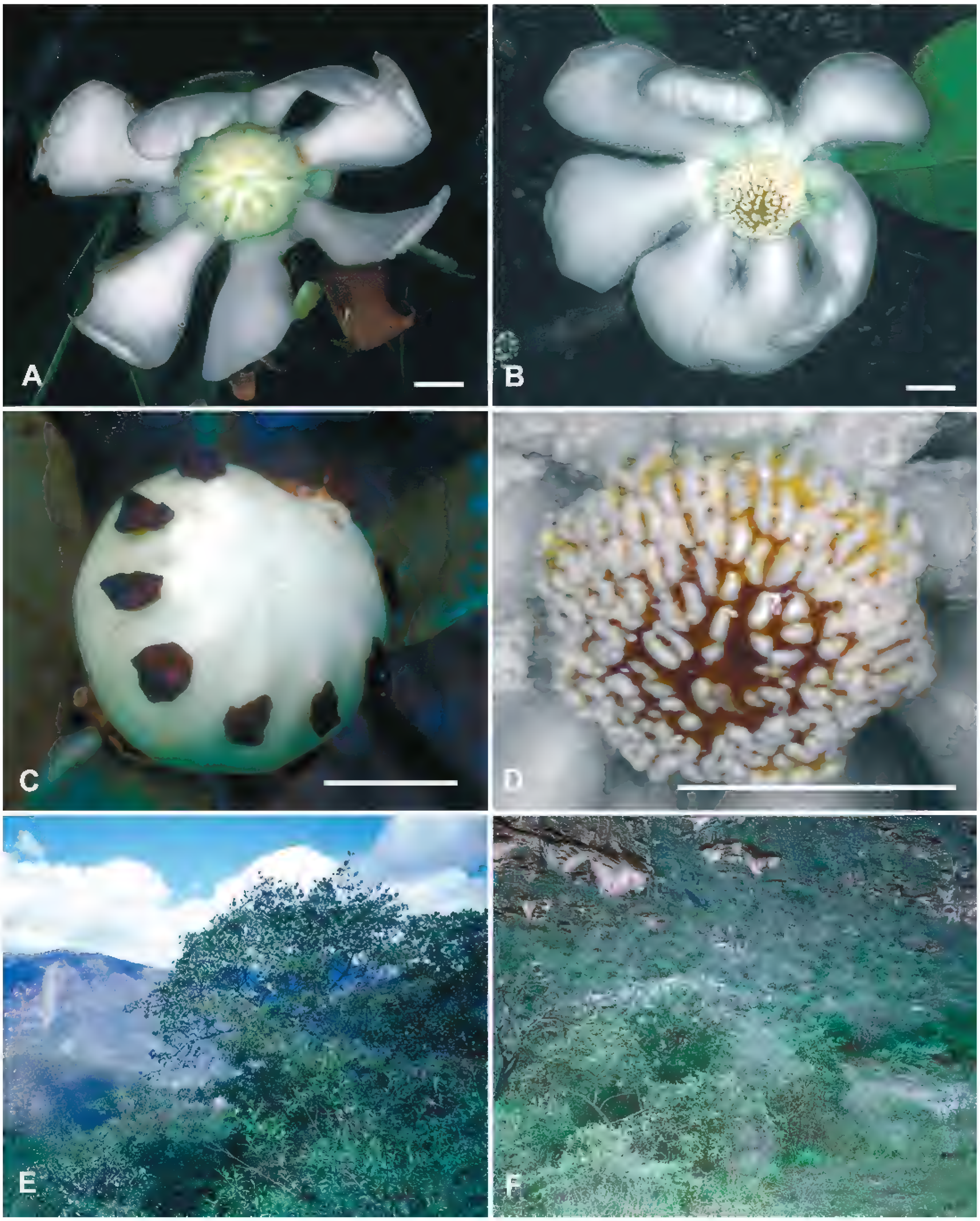

Figure 2. *Clusia magnoliiflora* M. H. G. Gust. —A. Pistillate flower from paratype (*Gustafsson 545*). —B. Staminate flower from holotype material (*Gustafsson 544*). —C. Fruit from specimen at the type locality. —D. Synandrium of holotype material (*Gustafsson 544*). —E, F. Plants in habitat. Scale bars = 10 mm. Photographs by M. H. G. Gustafsson.

inantly in species of lower altitudes (Holtum et al., 2004).

Highly characteristic for *Clusia magnoliiflora* are the large, white flowers with spatulate petals that do not overlap at the base (Fig. 2A, B). Furthermore, the arrangement of stigmata on the fruit is unique in that they are very widely spaced and positioned well below the apex (Fig. 2C). Molecular data (ITS sequences of holotype; GenBank accession number HM120218; sequence manually fitted to the alignment used by Gustafsson & Bittrich [2003]; methods generally as described therein) show that the species belongs to the

Retinostemon group. "Retinostemon," as a section name, was coined by Planchon and Triana (1860) and has been frequently used since, although it was never validly published. This group is well supported in molecular analyses (Gustafsson & Bittrich, 2003; Gustafsson et al., 2007) and is widespread in the Neotropics, with the highest diversity in Central America and northwestern South America (Gustafsson et al., 2007). Morphological characters supporting a position in the Retinostemon group include a central resiniferous synandrium in staminate flowers, a relatively high number (eight to 10) of stigmata, a staminodial ring in pistillate flowers, and prominent, straight laticifers visible as white lines on the adaxial side of the leaf.

Although molecular analyses clearly support a position for *Clusia magnoliiflora* within the Retinostemon group, its precise phylogenetic relationship remains unclear. Numerous species that appear to belong in this group still remain to be formally described and sampled for molecular study. One of these, represented by a single fruiting specimen recently collected in a similar habitat lower down in the Marañón valley (*T. Sarkinen 3041*, E), may well turn out to be the closest relative of *C. magnoliiflora*. The two species are similar in having branches with nodal constrictions and globular fruits with distantly positioned stigmata; *C. magnoliiflora* differs in its broader stigmata, narrower leaves, and much shorter stature.

Paratypes. PERU. **Amazonas:** Marañón valley, on rd. to Lonya Grande 50 km from main rd. Bagua Grande–Chamaya, 9 July 2002, *M. H. G. Gustafsson 545* (AAU, USM). **Cajamarca:** prov. Jaén, by rd. to La Palma, 2 km from main rd. Jaen–San Ignacio, 11 July 2002, *M. H. G. Gustafsson 546* (AAU, USM).

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Nomenclatural Notes on the Morinaceae and Valerianaceae in China

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Abstract. Two new combinations in the Morinaceae are proposed for the *Flora of China*: *Acanthocalyx nepalensis* (D. Don) M. J. Cannon subsp. *delavayi* (Franch.) D. Y. Hong and *Morina ludlowii* (M. J. Cannon) D. Y. Hong. Lectotypes are designated for three names in the Valerianaceae, *Valeriana daphniflora* Hand.-Mazz., *V. stenoptera* Diels, and *V. stenoptera* var. *cardaminea* Hand.-Mazz.

Key words: China, Morinaceae, Valerianaceae.

Nomenclatural actions are needed for the forthcoming treatment of two families, the Morinaceae and Valerianaceae, for volume 19 in the *Flora of China*. The Morinaceae are represented by two genera (*Acanthocalyx* (DC.) Tiegh., *Morina* L.) and 10 species, all in western China. The Valerianaceae are represented by three genera (*Nardostachys* DC., *Patrinia* Juss., *Valeriana* L.) and 33 species throughout China, mostly in southwestern provinces or regions.

Morinaceae

In the most recent taxonomic account for the Morinaceae in China (Hsing, 1986), only the one genus *Morina* with four species is treated. Based on examination of a large number of specimens including those in BM, E, and K, two genera and 10 species will be recognized in the forthcoming *Flora of China*, Volume 19, with four new species records for China from Tibet and Xinjiang, and the proposal for two new combinations is made here.

Acanthocalyx

1. Acanthocalyx nepalensis (D. Don) M. J. Cannon, Bull. Brit. Mus. (Nat. Hist.), Bot. 12(1): 12. 1984. Basionym: *Morina nepalensis* D. Don, Prodr. Fl. Nepal. 161. 1825. TYPE: Nepal. s.d., *N. Wallich 424* (holotype, K; isotypes, BM, E).

1a. Acanthocalyx nepalensis subsp. **nepalensis**.

1b. Acanthocalyx nepalensis subsp. **delavayi** (Franch.) D. Y. Hong, comb. et stat. nov. Basionym: *Morina delavayi* Franch., Bull. Soc. Bot. France 32: 8. 1885. *Acanthocalyx delavayi* (Franch.) M. J. Cannon, Bull. Brit. Mus. (Nat. Hist.), Bot. 12(1): 12. 1984. *Morina nepalensis* D. Don var. *delavayi* (Franch.) C. H. Hsing, Fl. Reipubl. Popularis Sin. 73(1): 51. 1986. *Morina nepalensis* D. Don subsp. *delavayi* (Franch.) D. Y. Hong & L. M. Ma, Vasc. Pl. Hengduan Mount. 2: 1931. 1994. TYPE: China. Yunnan: "In monte Hee-chan-men, prope Lan-kong," 2 June 1884, *Delavay 52* (holotype, P not seen).

According to Cannon and Cannon (1984: 11), the morphological differences between *Acanthocalyx delavayi* (Franch.) M. J. Cannon [≡ *A. nepalensis* subsp. *delavayi* (Franch.) D. Y. Hong] and *A. nepalensis* were the "corolla tube nearly glabrous beneath, straight" versus "hairy beneath, often somewhat curved," respectively, and the "ovary glabrous" versus "pubescent," respectively. However, based on examination of a large quantity of herbarium specimens, we found that discrete differences between them are a wider corolla (10–15 mm diam.) and a usually puberulous ovary in *A. delavayi* versus corollas 7–10 mm diam. and a usually glabrous ovary in *A. nepalensis*. These morphological differences are associated with geography, i.e., the above character states for *A. delavayi* are usually found in western Sichuan and northwestern Yunnan, while those for *A. nepalensis* are usually seen in material from southern Tibet, Bhutan, Nepal, and northern India. Therefore, given the evident geographic differences, the two taxa are better treated as two subspecies.

Morina

1. Morina ludlowii (M. J. Cannon) D. Y. Hong, comb. nov. Basionym: *Cryptothladia ludlowii* M. J. Cannon, Bull. Brit. Mus. (Nat. Hist.), Bot. 12(1): 22. 1984. TYPE: Bhutan. Ju La, Mangbe Chu, 4250 m, *Ludlow, Sherriff & Hicks 16903* (holotype, BM; isotype, E).

Cannon and Cannon (1984) raised *Morina* sect. *Cryptothladia* Blume to generic rank, *Cryptothladia* (Blume) M. J. Cannon. Morphological differences between *Cryptothladia* and *Morina*, as indicated by Cannon and Cannon, were: (1) the corolla equal to or shorter than the calyx in *Cryptothladia* versus much

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exceeding the calyx in *Morina*; (2) the corolla 2- to 4-lobed (rarely 5-lobed) in *Cryptothladia* versus 5-lobed in *Morina*; (3) the sterile stamens two and as large as the fertile pair, inserted at or near the base of the corolla tube in *Cryptothladia* versus the sterile stamens two, but much smaller than the fertile pair, and inserted just below the fertile two in *Morina*; and (4) the flowers probably cleistogamous in *Cryptothladia* versus not obviously cleistogamous in *Morina*. This last distinction for the flowers as cleistogamous or not may occur as a natural variation within a species. Comparison of the relative lengths of the perianth may or may not be useful for demarcation between species, and differences in the corolla lobing may occur among even closely related species as in the Campanulaceae, e.g., *Cyananthus lichiangensis* W. W. Sm. (5-lobed) and *C. hookeri* C. B. Clarke (mostly 4-lobed). The relative comparison of sterile and fertile stamen pairs may well apply for infrageneric groups. Furthermore, the Morinaceae can be divided into two (and only two) major groups, according to palynological (Blackmore & Cannon, 1983) and morphological evidence. Therefore, it seems appropriate to recognize two genera, *Morina* and *Acanthocalyx*, in the Morinaceae, and to merge *Cryptothladia* into *Morina*.

VALERIANACEAE

Three genera and about 33 species are recognized for the Valerianaceae in China in the forthcoming *Flora of China*, Volume 19: *Nardostachys* (one species, southwestern China), *Patrinia* (11 species throughout China, with six endemic taxa), and *Valeriana* (21 species, throughout China except in Guangdong and Hainan, with 13 endemic taxa).

VALERIANA

1. **Valeriana daphniflora** Hand.-Mazz., Acta Horti Gothob. 9: 179. 1934. TYPE: China. Sichuan: "Sze-ch'uan austro-occid." [southwest Sichuan], "Yenyüen" [Yanyuan], 2600 m, 2 Oct. 1914, *H. Handel-Mazzetti 5439, p.p.* (lectotype, designated here, WU).

Handel-Mazzetti 5439 is a mixed collection and consists of two sheets belonging to two different species in *Valeriana*. The specimen at WU has a long-tubular corolla and is thus in accordance with Handel-Mazzetti's 1934 protologue of *V. daphniflora*. However, the second sheet at E features a short and infundibular corolla and is in accordance with *V. stenoptera* Diels. Because Handel-Mazzetti did not designate either sheet as type, we here designate the sheet at WU as lectotype.

2. **Valeriana stenoptera** Diels, Notes Roy. Bot. Gard. Edinburgh 5: 295. 1912. TYPE: China. Yunnan: "Lichiang Range" [Lijiang], 27°25′N, 3050 m, Aug. 1906, *G. Forrest 2758* (lectotype, designated here, E; isotype, E).

Valeriana stenoptera Diels var. *cardaminea* Hand.-Mazz., Acta Horti Gothob. 9: 180. 1934, syn. nov. TYPE: China. Yunnan: [northwest Yunnan], "Chungtien" [Xianggelila], 3000–3100 m, 14 Aug. 1915, *H. Handel-Mazzetti 7648, p.p.* (lectotype, designated here, WU).

The collection *Handel-Mazzetti 7648*, cited by Handel-Mazzetti in 1934 as the type of *Valeriana stenoptera* var. *cardaminea*, consists of two sheets. The sheet at WU has an infundibular corolla with a short corolla tube (ca. 1.5 mm), which is in accordance with the protologue. The second sheet at E has an elongate corolla (ca. 6.5 mm) with a longer corolla tube (ca. 5.5 mm), which better corresponds to *V. daphniflora*. The E sheet, syntypic to the sheet at WU, is excluded from *V. stenoptera* var. *cardaminea*. Handel-Mazzetti (1934) did designate *Handel-Mazzetti 7648* as the type for his new variety. Because the WU sheet for *Handel-Mazzetti 7648* matches very well with the protologue, it is designated here as the lectotype for *V. stenoptera* var. *cardaminea*.

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Taxonomic Notes on Chinese Campanulaceae

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Abstract. Three new combinations are proposed for *Codonopsis convolvulacea* Kurz subsp. *grey-wilsonii* (J. M. H. Shaw) D. Y. Hong, *C. foetens* Hook. f. & Thomson subsp. *nervosa* (Chipp) D. Y. Hong, *C. pilosula* (Franch.) Nannf. subsp. *tangshen* (Oliv.) D. Y. Hong, with changes in rank for all three names. Nine specific, three subspecific, and seven varietal names are reduced to synonymy for the first time in the present paper. In addition, the following names are lectotypified: *C. benthamii* Hook. f. & Thomson, *C. bicolor* Nannf., *C. convolvulacea* subsp. *forrestii* (Diels) D. Y. Hong & L. M. Ma, *C. foetens* Hook. f. & Thomson, *C. foetens* subsp. *nervosa* (Chipp) D. Y. Hong, *C. macrocalyx* Diels, *C. macrocalyx* var. *coerulescens* Hand.-Mazz., *C. macrocalyx* var. *parviloba* J. Anthony, *C. modesta* Nannf., *C. rotundifolia* Benth. in Royle, and *Campanumoea pilosula* Franch. The name *Codonopsis convolvulacea* is neotypified.

Key words: Campanulaceae, China, *Codonopsis*, *Cyananthus*, Flora of China, *Lobelia*.

The most recent taxonomic treatment of the Campanulaceae in China appeared in the *Flora Reipublicae Popularis Sinicae*, Vol. 73(2) (Hong, 1983), in which 16 genera and 157 species were recognized for China. The present author has made further taxonomic revisions in association with Thomas Lammers for the *Flora of China* series. This revision will recognize 16 genera and 163 species, excluding the genera *Sphenoclea* Gaertn. and *Pentaphragma* (Roxb. ex Jack) Wall. ex G. Don, each as an independent family. *Cephalostigma* A. DC. and *Pratia* Gaudich. will be reduced to the synonymy of *Wahlenbergia* Schrad. ex Roth and *Lobelia* L., respectively. Additionally recognized will be the previously published genus *Echinocodon* D. Y. Hong (Hong, 1984) and the separation of *Cyclocodon* Griff. ex Benth. & Hook. f. from *Campanumoea* Blume. We here report associated and novel nomenclatural actions and synonymy to precede the taxonomic treatment of the Campanulaceae for a forthcoming volume of the *Flora of China* (Vol. 19).

Codonopsis

Codonopsis Wall. is an eastern and Middle Asian genus, in which we recognize 42 species (D. Y. Hong, unpublished). These taxa are concentrated in the Himalayas and adjacent Hengduan Mountains in China.

1. Codonopsis benthamii Hook. f. & Thomson, J. Proc. Linn. Soc., Bot. 2: 14. 1857. TYPE: India. Sikkim: Lachen, 2740 m, 31 July 1849, *J. D. Hooker s.n.* (lectotype, designated here, K).

Codonopsis macrocalyx Diels, Notes Roy. Bot. Gard. Edinburgh 5: 170. 1912, syn. nov. TYPE: China. Yunnan: Lijiang, 27°20′N, 3050–3350 m, Sep. 1906, *G. Forrest 3008* (lectotype, designated here, E; isotype, K).

Codonopsis macrocalyx Diels var. *parviloba* J. Anthony, Notes Roy. Bot. Gard. Edinburgh 15: 183. 1926, syn. nov. TYPE: China. Yunnan: Dali, on E flank of Tali range, 25°40′N, 2740–3050 m, July 1906, *G. Forrest 3854* (lectotype, designated here, K; isotype, E).

Codonopsis macrocalyx Diels var. *coerulescens* Hand.-Mazz., Akad. Wiss. Wien, Math.-Naturwiss. Kl., Anz. 61(20): 169. 1924, syn. nov. TYPE: China. Yunnan: Mekong–Salween divide, "Schöndsu-la," 24°4′N, 4025 m, 2 Aug. 1916, *H. F. von Handel-Mazzetti 9618* (lectotype, designated here, WU; isotype, E).

Discussion. In the protologue of *Codonopsis macrocalyx* var. *coerulescens*, Handel-Mazzetti designated only the one collection, his *9618*, but did not indicate the herbarium of deposit. As the author's work was based at the herbarium WU, I have chosen the sheet at WU as the lectotype.

Anthony described *Codonopsis macrocalyx* var. *parviloba* from material seen at E and K from Yunnan, China (*Forrest 3854*, *24723*), and Burma (Myanmar) (*F. Kingdon-Ward 1655*, E only). The earlier syntype by G. Forrest (*3854*, K) is selected as lectotype, with its duplicate at E.

Hooker's collection of *Codonopsis benthamii* consists of four sheets at Kew, collected on three occasions. The protologue of the species indicates "fl. Jul.," and thus I have chosen the specimen "31 Jul." as the lectotype.

The type specimen of *Codonopsis benthamii* was collected in Sikkim, India, while the type specimens of

C. macrocalyx and its two varieties were all from northwestern Yunnan in China. The group of plants from western Sichuan, southeastern Tibet, and northwestern Yunnan has been treated as *C. macrocalyx* or its varieties. However, examining a large quantity of specimens including the syntypes of *C. benthamii* from Nepal, Sikkim, and Bhutan at K and E in 2007, I found that the western and eastern populations actually comprise a single group without distinct differences. The distributional range of *C. benthamii* extends from Nepal eastward to western Sichuan in China, and via Sikkim, Bhutan, Assam, into southeastern Tibet and northern Burma (Myanmar).

2. Codonopsis bhutanica Ludlow, J. Roy. Hort. Soc. 97: 127. 1972. TYPE: Bhutan. Shingbe, Me La, 3700 m, 2 July 1949, *F. Ludlow, G. Sherriff & J. H. Hicks 20786* (holotype, BM; isotypes, E, K).

Codonopsis xizangensis D. Y. Hong, Acta Phytotax. Sin. 18: 246. 1980, syn. nov. TYPE: China. Xizang [Tibet]: Cona, 1975, *C. Y. Wu & S. K. Chen 75-907* (holotype, KUN).

Discussion. Cona County in Tibet is very close to the border between China and Bhutan. When I described *Codonopsis xizangensis* as new, I was unaware of the similar *C. bhutanica*. They are apparently conspecific, sharing a small tubular corolla, a glabrous calyx tube, and an erect or ascending, usually multiflowered stem.

3. Codonopsis convolvulacea Kurz, J. Bombay Nat. Hist. Soc. 11: 195. 1873. TYPE: China. Yunnan: Mengzi, 1520–1830 m, s.d., *A. Henry 9425* (neotype, designated here, PE; isotypes, E, K).

Discussion. Kurz's protologue (1873: 195) mentioned only "Yunnan, Hotha, 15 Aug. (fl.)" for type detail. The present author visited quite a large number of herbaria worldwide, including BM, E, G, K, LD, W, WU, and CAL (where Kurz had been curator of the herbarium since 1864), but I failed to find the collection. It seems to me that the collection was not preserved. A comparable collection from Yunnan representative of the species is selected as neotype at PE, with duplicates available at E and K.

3a. Codonopsis convolvulacea subsp. **convolvulacea**.

3b. Codonopsis convolvulacea subsp. **forrestii** (Diels) D. Y. Hong & L. M. Ma, Fl. Sichuan. 10: 546. 1992. Basionym: *Codonopsis forrestii* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 171. 1912. TYPE: China. Yunnan: on banks of Yangtse (Lijiang?), 1530–2130 m, Sep. 1904, *G. Forrest 48* (lectotype, designated here, E; isotype, CAL).

Codonopsis retroserrata Z. T. Wang & G. J. Xu, Acta Phytotax. Sin. 31(2): 186, fig. 2. 1993, syn. nov. TYPE: China. Sichuan: Yanyuan, 2400 m, 5 Sep. 1986, *Z. T. Wang 869382* (holotype, CPU not seen; isotype, PE).

3c. Codonopsis convolvulacea Kurz subsp. **grey-wilsonii** (J. M. H. Shaw) D. Y. Hong, comb. et stat. nov. Basionym: *Codonopsis grey-wilsonii* J. M. H. Shaw, New Plantsman 3(2): 93. 1996. Replaced synonym: *Codonopsis nepalensis* Grey-Wilson, Plantsman 12(2): 99. 1990, non *Codonopsis nepalensis* Hara, 1978. TYPE: Nepal. W of Marpa, 3500 m, 6 Sep. 1973, *Grey-Wilson & Philips 777* (holotype, K).

Discussion. Diels mentioned the collection *G. Forrest 48* in the 1912 protologue for his name *Codonopsis forrestii*, but did not indicate the herbarium of deposit (Diels, 1912). As far as is known, this collection is deposited in at least two herbaria, E and CAL. I examined the specimen in E first and select it as lectotype because I think it is more easily accessible.

The authors of *Codonopsis retroserrata* compared their specimen (*Z. T. Wang 869382*) with *C. convolvulacea* var. *hirsuta* (Hand.-Mazz.) Nannf., but not with *C. convolvulacea* subsp. *forrestii* [≡ *C. forrestii*]. I am unable to find any significant difference between *C. retroserrata* and *C. convolvulacea* subsp. *forrestii* and therefore synonymize *C. retroserrata* to *C. convolvulacea* subsp. *forrestii* here.

Critical examination of all specimens available at BM, E, K, KUN, and PE, as well as field observations in southern Tibet and northwestern Yunnan, shows the *Codonopsis convolvulacea* group to be extremely variable. The group is distributed from southern Yunnan to Nepal via northwestern Yunnan, western Sichuan, and southern Tibet. According to my observations, plants in Nepal and southern Tibet differ from those in the other regions in having relatively larger leaves, a relatively larger corolla with the lower third internally pubescent and with a remarkable dark purple ring at base, and the hypanthium and fruit sometimes rounded at base. However, these differences are correlated with geography but are not distinct. I therefore consider *C. grey-wilsonii* as a geographical race and thus treat it here as a subspecies of *C. convolvulacea*.

4. Codonopsis foetens Hook. f. & Thomson, J. Proc. Linn. Soc., Bot. 2: 16. 1857. TYPE: [India.] Sikkim: Kengna, Lachen, 4570 m, 24 July 1849,

J. D. Hooker s.n. (lectotype, designated here, K; isotype, BM).

Discussion. J. D. Hooker made three collections, all represented at Kew, for *Codonopsis foetens* from Sikkim at altitudes from 4270 to 4880 m in 1849, on July 15, July 24, and September 11. The specimen collected on July 24 is relatively complete and gives the altitude as 4570 m, and I have therefore chosen it as the lectotype.

Codonopsis foetens is characterized by its small leaves, erect and single-flowered stems, always hispidulous calyx lobes, and campanulate corolla. The taxon consists of two subspecies. The typical subspecies has smaller leaf blades (5–9[–15] × 5–7 [–12] mm), and the calyx lobes are often verrucose-serrate. It is found from Sikkim to southern Tibet (eastward to Zayü). The other subspecies occupies the eastern part of the species range, i.e., southeastern Gansu, southeastern Qinghai, western Sichuan, the southeastern corner of Tibet, and northwestern Yunnan in China.

4a. Codonopsis foetens subsp. **foetens**.

4b. Codonopsis foetens Hook. f. & Thomson subsp. **nervosa** (Chipp) D. Y. Hong, comb. et stat. nov. Basionym: *Codonopsis ovata* Benth. var. *nervosa* Chipp, J. Linn. Soc., Bot. 38: 385. 1908. *Codonopsis nervosa* (Chipp) Nannf., Acta Horti Gothob. 5: 26, pl. 13b. 1930. TYPE: China. Sichuan: "Tachienlu" [Kangding], s.d., *A. E. Pratt 632* (lectotype, designated here, K).

Codonopsis nervosa (Chipp) Nannf. subsp. *macrantha* (Nannf.) D. Y. Hong & L. M. Ma, Fl. Sichuan. 10: 541. 1992, syn. nov. Basionym: *Codonopsis macrantha* Nannf., Notes Roy. Bot. Gard. Edinburgh 16: 157, fig. 1a, pl. 229. 1931. *Codonopsis nervosa* (Chipp) Nannf. var. *macrantha* L. T. Shen in D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 57. 1983. TYPE: China. SE Tibet, Salween–Kiujiang divide, 28°40′N, 98°15′E, Aug. 1919, *G. Forrest 18949* (holotype, E; isotypes, K, W).

Discussion. Chipp cited the two specimens in the protologue for *Codonopsis ovata* var. *nervosa*, *Wilson 3984* and *Pratt 632*. Although Chipp mentioned *Wilson 3984* first, the specimen has no exact locality. Thus, I have chosen *Pratt 632* as the lectotype.

The type of *Codonopsis ovata* var. *nervosa* [≡ *C. foetens* subsp. *nervosa*] is from Kangding in Sichuan Province, China, while that of *C. macrantha* is from Markam in the southeastern corner of Tibet. Plants of this group in China have been recognized as *C. nervosa* and *C. macrantha* or two subspecies or varieties. A critical examination of hundreds of specimens, including the types of *C. foetens* and the two infraspecific taxa mentioned above, shows that this group of plants, which extends from Sikkim eastward to western Sichuan and northward to southeastern Qinghai and southeastern Gansu, cannot be split into two distinct units at the species level.

Codonopsis foetens subsp. *nervosa* differs from the typical subspecies only in having larger leaf blades (10–15 × 10–15 mm) and calyx lobes that are always entire.

5. Codonopsis levicalyx L. T. Shen, Acta Phytotax. Sin. 13(3): 55, pl. 5, fig. 11a, b. 1975. TYPE: China. Sichuan: Nanping, Lingjiang, 2900 m, s.d., *X. Y. Tan & J. Z. Wu 6407* (holotype, WCU not seen).

Codonopsis levicalyx L. T. Shen var. *hirsuticalyx* L. T. Shen in D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 183. 1983, syn. nov. TYPE: China. Sichuan: Emei Shan, s.d., *M. L. Tu & Y. L. Zhen 51-01* (holotype, WCU not seen).

Codonopsis rotundifolia Benth. var. *angustifolia* Nannf., Bot. Mag. 167, pl. 131. 1950, syn. nov. TYPE: China. Xizang [Tibet]: Nyingchi [Kongbo Prov.], Doshong, 28 July 1938, *F. Ludlow, G. Sherriff & G. Taylor 5377a* (holotype, BM).

Discussion. The species *Codonopsis rotundifolia* has the leaves mostly cordate, less frequently truncate or rounded at the base, dentate on the margins, and nearly glabrous or sparsely hirsute along the veins on both surfaces; it is found west of 86°E. However, *C. rotundifolia* var. *angustifolia* was described from Nyingchi in southeastern Tibet (Kongbo Province) and is contrasted by its leaves that are cuneate or obtuse at the base, crenulate or entire on the margins, and sparsely or densely hirsute on both surfaces. Our critical examination of the type and paratype specimens and a large number of other collections from this region shows that they are conspecific with *C. levicalyx*, but distinctly differ from *C. rotundifolia*.

6. Codonopsis pilosula (Franch.) Nannf., Acta Horti Gothob. 5: 29. 1930. Basionym: *Campanumoea pilosula* Franch., Pl. David. 1: 192. 1884. TYPE: China. "near Pékin" [Beijing], cult. in "Ta-tchiao-cha" as medicinal plants, July 1863, *A. David 2333* (lectotype, designated here, P not seen).

Codonopsis microtubulosa Z. T. Wang & G. J. Xu, Acta Phytotax. Sin. 31(2): 184, fig. 1. 1993, syn. nov. TYPE: China. Sichuan: Nanping, 2500 m, 23 July 1986, *Z. T. Wang & B. Y. Yü 867206* (holotype, CPU not seen; isotype, PE).

Codonopsis pilosula (Franch.) Nannf. var. *volubilis* (Nannf.) L. T. Shen in D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 41. 1983, syn. nov. Basionym: *Codonopsis volubilis* Nannf., Bot. Tidsskr. 34: 388, pl. 5, fig. 1h. 1940. TYPE: China. Shanxi: "Chiao-chéng distr."

[Jiaocheng Co.], 1900 m, 20 Aug. 1924, *H. Smith 7201* (holotype, GH not seen; isotypes, BM, PE).

Codonopsis pilosula (Franch.) Nannf. var. *glaberrima* (Nannf.) P. C. Tsoong ex L. T. Shen et al., Acta Phytotax. Sin. 13(3): 58. 1975, syn. nov. Basionym: *Codonopsis glaberrima* Nannf., Bot. Tidskr. 34: 387. 1940. TYPE: China. [Central] Shanxi: "Koan yün miao," 1500–1700 m, 24 Aug. 1916, *E. Licent 2793* (holotype, W).

Codonopsis pilosula (Franch.) Nannf. var. *modesta* (Nannf.) L. T. Shen in D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 41. 1983, syn. nov. Basionym: *Codonopsis modesta* Nannf., Acta Horti Gothob. 5: 26. 1930. TYPE: China. [N] Sichuan: "Ch'un-Ch'e," ca. 3200 m, s.d., *H. Smith 4304* (lectotype, designated here, BM; isotype, GH not seen).

Discussion. *Codonopsis pilosula* [≡ *Campanumoea pilosula*] has been cultivated very commonly in northern China, and it is nearly the only species of *Codonopsis* in cultivation. Therefore, the collection *A. David 2333*, cultivated in Beijing, is designated here as the lectotype. It is preferred to the P syntype, *A. David 2809*, noted to be from "Inner Mongolia, Ourato," which was collected three years later, in 1866.

The protologue of *Codonopsis microtubulosa* stated that the taxon differed from *C. pilosula* in having a smaller corolla and smaller leaves. However, it resembles *C. pilosula* very much in general appearance, and thus I consider the taxon to be an extreme form or a mutant of *C. pilosula*. The name *C. microtubulosa* is newly synonymized herein to *C. pilosula*.

In the 1930 protologue for *Codonopsis pilosula* var. *modesta*, Nannfeldt indicated *H. Smith 4304* as the type and *H. Smith 4009* (N Sichuan: Sung-pan [Songpan], Huang-Ch'en-Kuan, ca. 3200 m, s.d., GH not seen) as the paratype, but failed to indicate any herbarium of deposit for either collection. The type is clarified here, following the describing author's intent.

6a. Codonopsis pilosula subsp. **pilosula**.

6b. Codonopsis pilosula subsp. **tangshen** (Oliv.) D. Y. Hong, comb. et stat. nov. Basionym: *Codonopsis tangshen* Oliv., Hooker's Icon. Pl. 20: tab. 1966. 1891. TYPE: China. "W Hupeh [Hubei]: Hsingshan [Xingshan Co.]," s.d., *A. Henry 6468* (holotype, K 000229965; isotypes, K 000229964, K 000229966, K 000229969).

Discussion. *Codonopsis tangshen* [≡ *C. pilosula* subsp. *tangshen*] differs from *C. pilosula* only in having the calyx adnate to the base of the ovary and thus nearly entirely free from the ovary in appearance, and in its leaves that are mostly truncate, rounded, or less frequently cordate at the base. However, these two differences are quantitative and gradational. For example, five sheets of four collections at K from Mt. Taibai, Shaanxi Province (*W. Purdom 675* [2 sheets] and *s.n.*, and *E. Licent 3191*), have been examined, which show that the calyx tube varies in length from 1.5 mm (similar to the typical form of *C. tangshen*) to 3 mm (somewhat similar to *C. pilosula*). *Codonopsis pilosula* subsp. *tangshen* occurs in western Hubei and adjacent regions.

7. Codonopsis rotundifolia Benth. in Royle, Ill. Bot. Himal. Mts. 254, tab. 62. 1839. TYPE: Tab. 62 in Royle, 1839 (lectotype, designated here, tab. 62 in Royle, 1839).

Codonopsis longifolia D. Y. Hong, Acta Phytotax. Sin. 18: 245–246, pl. 1, fig. 4. 1980, syn. nov. TYPE: China. Xizang [Tibet]: Nyalam, 3600–3700 m, 27 Aug. 1972, *Xizang Chinese Materia Medic. & Herbs Exped. 1563* (holotype, PE).

Discussion. *Codonopsis rotundifolia* was described by Bentham (Royle, 1839) from northwestern India, while *C. longifolia* was known from Nyalam in southern Tibet. *Codonopsis rotundifolia* is a rather variable species with the leaf base varying from cordate to rounded, the leaf blades from glabrous to sparsely hirsute, and the calyx lobes from glabrous to densely ciliate. The type specimen of *C. longifolia* falls within the range of variation of *C. rotundifolia*. Because no specimen has been found for *C. rotundifolia*, the 1839 plate associated with the protologue is selected as lectotype.

8. Codonopsis viridiflora Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 27: 496. 1881. TYPE: China. "Prov. Kansu" [Gansu]: 1872, *N. M. Przewalsky 316* (holotype, K).

Codonopsis bicolor Nannf., Acta Horti Gothob. 5: 24. 1930, syn. nov. TYPE: China. Sichuan: "Dongrergo," ca. 4200 m, s.d., *H. Smith 3530* (lectotype, designated here, E; isotypes, BM, PE).

Discussion. Nannfeldt (1930) did indicate *H. Smith 3530* as the type in the protologue of *Codonopsis bicolor*, but failed to designate the herbarium of deposit. This oversight is clarified herein.

The present author examined the types of *Codonopsis viridiflora* and *C. bicolor*, as well as a large quantity of specimens from Gansu and western Sichuan, but I failed to find any significant differences. Instead, the two names should be considered as conspecific, with *C. viridiflora* having priority.

Cyananthus

The genus *Cyananthus* Wall. ex Benth. is endemic to the Pan-Himalayan region (the Himalayas and the Hengduan Mountains). There are three recent taxonomic treatments: Lian (1983) recorded 25 species in

China; Hong and Ma (1991) recognized 19 species, with 18 in China; and Shrestha (1997) recognized 23 species, with 20 in China. Seventeen species will be recognized in a forthcoming volume of the *Flora of China* (Vol. 19).

1. **Cyananthus hookeri** C. B. Clarke in Hook. f., Fl. Brit. Ind. 3: 435. 1881. TYPE: Nepal. [E Nepal], Wamanchun (Wolangchung), 4300 m, s.d., *J. D. Hooker 249* (holotype, K).

Cyananthus cronquistii K. K. Shrestha, Kew Bull. 49(1): 143. 1994, syn. nov. TYPE: China. Yunnan: "Atuntze" [Dêqên], 28°35′N, 99°10′E, 4420 m, s.d., *G. Forrest 20165* (holotype, E).

Discussion. *Cyananthus cronquistii* was described by Shrestha (1994) as new, based on its differences from *C. hookeri* mainly in the plants being glabrous (vs. densely hairy in *C. hookeri*), the calyx being sparsely hairy with soft brown hairs (vs. densely covered with stiff whitish hairs), and its smaller corolla less than 1 cm long (vs. longer than 1 cm). However, the holotype for *C. cronquistii* (*G. Forrest 20165*) has corollas 9–10 mm long and calyces with sparsely stiff whitish hairs. *Cyananthus hookeri* was later described by Shrestha (1997: 431) as having "corolla…0.7–1.3 cm long." Among a large number of specimens in K and E determined by Shrestha to either *C. hookeri* or *C. cronquistii*, one is unable to apply the discrete differences as mentioned above. For example, *Handel-Mazzetti 7714* (K), determined as *C. hookeri*, has glabrous stems and leaves, and the calyx is very sparsely hairy (more sparsely than typical for *C. cronquistii*). In contrast, the WU sheet of the same collection does have glabrous stems, but varies in having only sparsely hairy leaves and a calyx that is rather densely hairy. The K accession for *Delavay 148*, determined as *C. hookeri*, possesses glabrous stems, sparsely hairy leaves, and calyces that are moderately to densely hairy. By comparison, the E accession for *G. Forrest 22477*, identified as *C. cronquistii*, has calyces with rather densely yellow stiff hairs and corollas to 11 mm long. Such variability suggests that the two taxa are not distinct, and *C. hookeri* is the prior name.

2. **Cyananthus incanus** Hook. f. & Thomson, J. Proc. Linn. Soc., Bot. 2: 20. 1857. TYPE: [India.] Sikkim: 3660–3960 m, 23 July 1849, *J. D. Hooker s.n.* (holotype, K).

Cyananthus incanus Hook. f. & Thomson subsp. *petiolatus* (Franch.) D. Y. Hong & L. M. Ma, Acta Phytotax. Sin. 29(1): 44. 1991, syn. nov. Basionym: *Cyananthus petiolatus* Franch., Bull. Soc. Philom. Paris, sér. 8, 3: 147. 1891. TYPE: China. Sichuan: "Ta-tsien-lou" [Kangding], s.d., *R. P. Soulié s.n.* (holotype, P not seen).

Cyananthus incanus Hook. f. & Thomson subsp. *orientalis* K. K. Shrestha, Acta Phytotax. Sin. 35(5): 407. 1997, syn. nov. TYPE: Nepal. Upper Barun valley, 4950 m, 20 Sep. 1972, *T. Wraber 238* (holotype, BM; isotypes, E, LE not seen).

Cyananthus dolichosceles C. Marquand, Bull. Misc. Inform. Kew 1924: 250. 1924, syn. nov. TYPE: China. Sichuan: 2700–3200 m, July 1903, *E. H. Wilson 3983* (holotype, K).

Discussion. Shrestha (1997) stated that his *Cyananthus incanus* subsp. *orientalis* differed from the typical subspecies in having the stems moderately pubescent and the calyx glabrous. However, the specimen *Cutting & Vernay 124* from Tibet (K), determined by Shrestha, shows rather dense pubescence on the calyx, and additional specimens seen at K (*Cutting & Vernay 109A, 104B, 107*) also reveal brown hirsute hairs on the calyces. It is clear that the variation in the indumentum of stems and calyx occurs within this specimen group, but does not appear to be correlated with geography.

Marquand (1924) compared *Cyananthus dolichosceles* to *C. pedunculatus* C. B. Clarke (Clarke, 1881), stating that it differed from the latter in having the calyx glabrous and the peduncles shorter (to 1–4 cm). Hong and Ma (1991) and Shrestha (1997) correctly compared *C. dolichosceles* to *C. incanus*, noting that it differed from the latter in the glabrous or nearly glabrous calyces, as well as the longer peduncles (6–30 mm vs. < 10 mm). Examination of many exsiccatae from Kangding (the type locality for *C. dolichosceles*) in PE shows that the lengths of peduncles and the indumentum of the calyces vary widely, and that the differences among individuals within a single collection may span the variability between these two taxa. For example, in the collection *Kuan & Wang 804* (PE), the peduncles vary from 5 to 15 mm and the calyx indument ranges from glabrous to sparsely hairy. Another PE collection, *Kuan & Wang 1033*, has peduncles from 3 to 14 mm, while the calyces range from glabrous to rather densely hairy. Finally, *C. S. Liu 1287* at PE has even longer peduncles from 8 to 17 mm, while the calyces may be glabrous, sparsely hairy, or even moderately to densely hairy.

Lobelia

Lobelia is a large and nearly cosmopolitan genus with approximately 350 species, mainly in the tropics and subtropics. A few species extend in distribution into temperate regions, and 24 species will be recognized in the forthcoming treatment of the Campanulaceae for the *Flora of China* (Vol. 19).

1. Lobelia davidii Franch., Nouv. Arch. Mus. Hist. Nat., sér. 2, 6: 82. 1883. TYPE: China. "Kiang-si [Jiangxi]: Kiukiang" [Jiujiang], s.d., *A. David s.n.* (holotype, P not seen).

Lobelia tibetica W. L. Zheng, Acta Phytotax. Sin. 36(6): 549, fig. 1. 1998, syn. nov. TYPE: China. Xizang [Tibet]: Mainling, 3200 m, 2 Sep. 1992, *W. L. Zheng 0472* (holotype, Hb. Plateau Ecol. Inst., Tibet; isotype, PE).

Discussion. *Lobelia davidii*, according to our taxonomic concept, is widely distributed from Taiwan in the east to southeastern Tibet in the west. The species is also variable in morphology, particularly in the lengths of the calyx lobes and corollas, as well as the density of flowers on the inflorescences, leaf shapes, and the general indumentum of the plants. With the result of our examination of the isotype and a large quantity of specimens, the present author considers that *L. tibetica* is still within the wide variation range of *L. davidii*.

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Taxonomic Notes on the Genus *Adenophora* (Campanulaceae) in China

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ABSTRACT. New combinations are proposed for four names in Chinese *Adenophora* Fisch. (Campanulaceae), with three names also changing in rank: *A. capillaris* Hemsl. subsp. *paniculata* (Nannf.) D. Y. Hong & S. Ge, *A. petiolata* Pax & K. Hoffm. subsp. *huadungensis* (D. Y. Hong) D. Y. Hong & S. Ge, *A. petiolata* subsp. *hunanensis* (Nannf.) D. Y. Hong & S. Ge, and *A. stricta* Miq. subsp. *aurita* (Franch.) D. Y. Hong & S. Ge. Lectotypes are designated for the following names: *A. capillaris*, *A. capillaris* subsp. *leptosepala* (Diels) D. Y. Hong [≡ *A. leptosepala* Diels], *A. liliifolioides* Pax & K. Hoffm., *A. polyantha* Nakai, and *A. chanetii* (H. Lév.) D. F. Chamb. [≡ *Campanula chanetii* H. Lév.].

Key words: *Adenophora*, Campanulaceae, China.

The genus *Adenophora* Fisch. (Campanulaceae) is apparently recently derived from the genus *Campanula* L. and is still strongly differentiated (Hong, 1983). Variability in morphological characters such as leaf shape is a prominent feature of *Adenophora*, and this wide range of variation in leaf shape in this genus has been discussed several times (Hong, 1983; Qiu & Hong, 1993; Ge & Hong, 1995). However, previous authors described this variability as a large number of specific and infraspecific taxa, based on a single or occasionally few specimens and a single morphological character. Forty-eight specific and infraspecific taxa have been previously synonymized by Hong (1983), but many new names have arisen thereafter. In a forthcoming volume of *Flora of China* (Vol. 19), 38 species will be recognized; many specific and varietal names published after 1983 will be reduced to synonymy. In this paper, four new combinations are made and five lectotypes are designated.

1. Adenophora capillaris Hemsl., J. Linn. Soc., Bot. 26(173): 10. 1889. TYPE: China. Hubei: Patung Distr. [Badong Co.], s.d., *A. Henry 954* (lectotype, designated here, K).

There are two syntypes for *Adenophora capillaris* identified among the holdings at K, both collected by A. Henry (*954*, *4788*), and the earlier collection is selected as lectotype.

1a. Adenophora capillaris subsp. **capillaris**.

1b. Adenophora capillaris subsp. **leptosepala** (Diels) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 136. 1983. Basionym: *Adenophora leptosepala* Diels, Notes Roy. Bot. Gard. Edinburgh 5(25): 175. 1912. TYPE: China. Yunnan: Dali range, E flank, Sep. 1906, *G. Forrest 3857* (lectotype, designated here, E).

There are two syntypes, both at E, collected by G. Forrest (*3857*, *3858*) from Yunnan, China, and the earlier collection is selected as lectotype.

1c. Adenophora capillaris subsp. **paniculata** (Nannf.) D. Y. Hong & S. Ge, comb. et stat. nov. Basionym: *Adenophora paniculata* Nannf., Acta Horti Gothob. 5: 19. 1930. TYPE: China. "Shansi austr. [S Shanxi]: Yüan-ch'ü distr. [Yuanqu], Shui-wang-ping [Shunwangping]," ca. 1800 m, 21 July 1924, *H. Smith 6651* (holotype, GH not seen).

Subspecies *paniculata* differs from other subspecies of *Adenophora capillaris* only in having the calyx lobes generally shorter and entire, the capsule usually ovoid or ovoid-oblong, and the inflorescence branches shorter and more robust. However, a variety of gradations can be found, and there is no distinct demarcation between the subspecies.

Adenophora capillaris subsp. *paniculata* is known to be distributed in Hebei (northward to Longguan, Wuling Shan), Henan (Lingbao, Linxian, Lushi, Luanchuan, Songxian, Yiyang), Nei Mongol (Daqing Shan, Tumd Qi, Xinghe), Shaanxi (Qinling Range), and Shanxi (Hong, 1983).

2. Adenophora liliifolioides Pax & K. Hoffm., Repert. Spec. Nov. Regni Veg. Beih. 12: 499. 1922. TYPE: China. Sichuan: "Ost-Tibet: Dege [Dêgê]," 3900 m, *W. Limpricht 2112* (lectotype, designated here, WU; isotype, WRSL).

Pax and Hoffmann cited two syntypes in the 1922 protologue: *Limpricht 2112* from Dêgê in Sichuan

Province and *2807* from the Qinling Range in Shaanxi Province. The collection from Dêgê is consistent with the protologue, so it is designated as the lectotype.

3. Adenophora petiolata Pax & K. Hoffm., Repert. Spec. Nov. Regni Veg. Beih. 12: 499. 1922. TYPE: China. "Schenhsi [Shaanxi]: Tsin ling schan [Qinling Range], Paßhöhe Tsin ling südöstlich Pauki, 2000 m," s.d., *W. Limpricht 2808* (holotype, WRSL not seen).

3a. Adenophora petiolata subsp. **petiolata**.

3b. Adenophora petiolata subsp. **huadungensis** (D. Y. Hong) D. Y. Hong & S. Ge, comb. nov. Basionym: *Adenophora hunanensis* Nannf. subsp. *huadungensis* D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 186. 1983. TYPE: China. Jiangxi: Shangrao, Wangfu Shan, 1000 m, 13 Aug. 1958, *M. X. Nie 5029* (holotype, PE).

Subspecies *huadungensis* had been previously considered parapatric with the subspecies *hunanensis* (Hong, 1983). Now the latter merges into *Adenophora petiolata* as a subspecies, and thus the three parapatric subspecies form a polytypical species distinguished by the petiolate leaves, the relatively wide and entire calyx lobes, and a campanulate corolla equal to the style in length.

3c. Adenophora petiolata subsp. **hunanensis** (Nannf.) D. Y. Hong & S. Ge, comb. et stat. nov. Basionym: *Adenophora hunanensis* Nannf. in Hand.-Mazz., Symb. Sin. 7: 1070. 1936. TYPE: China. Hunan: WuKang [Wugang Co.], 1100–1400 m, 10 Aug. 1918, *F. H. von Handel-Mazzetti 12424* (holotype, WU; isotype, WU).

The specimens from the Qinling Range and those from western Hunan are quite different from each other. However, if one examines specimens across a broad geographic area (i.e., from Gansu, Shaanxi, Shanxi in the north to Guangdong in the south via Henan and Hubei), the morphological gradation and differences correlate with geography. All of these collections share petiolate leaves, relatively wide calyx lobes, and the style nearly equal to the corolla in length (Hong, 1983), which are characters that characterize *Adenophora petiolata* subsp. *hunanensis*.

4. Adenophora polyantha Nakai, Bot. Mag. (Tokyo) 23(723): 188. 1909. TYPE: Korea. Phyöng-an: Phyöng-yang, s.d., *T. Uchiyama s.n.* (lectotype, designated here, TI).

There are two syntypes collected by T. Uchiyama, both at TI, and the one cited first is chosen as the lectotype.

4a. Adenophora polyantha subsp. **polyantha**.

4b. Adenophora polyantha subsp. **scabricalyx** (Kitag.) J. Z. Qiu & D. Y. Hong, Acta Phytotax. Sin. 31(1): 39. 1993. Basionym: *Adenophora polyantha* var. *scabricalyx* Kitag., Rep. First Sci. Exped. Manchoukou 4, 2: 112. 1935. TYPE: China. "Jê-Hê [Hebei]: Chang-shan-yü," 14 Sep. 1933, *Nakai, Honda & Kitagawa s.n.* (holotype, TI).

Adenophora chanetii (H. Lév.) D. F. Chamb., Notes Roy. Bot. Gard. Edinburgh 35: 248. 1977, syn. nov. Basionym: *Campanula chanetii* H. Lév., Repert. Spec. Nov. Regni Veg. 9: 450. 1911. TYPE: China. Hebei: Fuping, June 1909, *L. Chanet 426* (lectotype, designated here, E).

Adenophora scabridula Nannf. var. *viscida* P. C. Tsoong, Contr. Inst. Bot. Nat. Acad. Peiping, 3(3): 80. 1935, syn. nov. TYPE: China. "Hopei [Hebei]: vic. of Peiping [Beijing]," 21 Aug. 1934, *P. C. Tsoong 803* (holotype, PE).

Hector Léveillé (1911) described *Campanula chanetii* on the basis of two syntypes, *L. Chanet 426* and *569*, and both are present at E. The earlier collection from 1909 is selected over the August 1910 *Chanet 569* collection.

When first investigating the *Adenophora polyantha* group (Qiu & Hong, 1993), we were unaware of the names *A. chanetii* and *A. scabridula* var. *viscida*. Both correspond to the *A. polyantha* group, and both names synonymize to *A. polyantha* subsp. *scabricalyx*.

5. Adenophora stricta Miq., Ann. Mus. Bot. Lugduno-Batavi 2: 192. 1866.

5a. Adenophora stricta subsp. **stricta**.

Adenophora stricta Miq. var. *nanjingensis* P. F. Tu & G. J. Xu, J. China Pharm. Univ. 21(1): 17, fig. 1E. 1990, syn. nov. TYPE: China. Jiangsu: Nanjing, Qixia Shan, 21 Oct. 1986, *P. F. Tu 86036* (holotype, CPU not seen).

Adenophora stricta Miq. var. *qinglongshanica* P. F. Tu & G. J. Xu, J. China Pharm. Univ. 21(1): 17, fig. 1D. 1990, syn. nov. TYPE: China. Jiangsu: Nanjing, Qixia Shan, 11 Oct. 1986, *P. F. Tu 86033* (holotype, CPU not seen).

Both varieties described by Tu et al. (1990) differ just slightly from the most common form of *Adenophora stricta* subsp. *stricta*. Their distributions are sympatric with the typical subspecies, sharing similar habitats in China. Varieties *nanjingensis* and *qinglongshanica* both synonymize to the autonymic subspecies for *A. stricta*.

5b. Adenophora stricta subsp. **aurita** (Franch.) D. Y. Hong & S. Ge, comb. et stat. nov. Basionym:

Adenophora aurita Franch., J. Bot. (Morot) 9: 366. 1895. TYPE: China. Sichuan: Ta-tsien-lou [Kangding], 1893, *J. A. Soulie 501* (holotype, P not seen; isotype, G).

Adenophora stricta subsp. *aurita* is rather similar to *A. stricta* subsp. *sessilifolia* D. Y. Hong. Subspecies *aurita* differs only in having the corolla slightly longer (2–2.5 cm vs. 1.5–2.3 cm) and the floral disc relatively longer (1.8–2.5 mm vs. 1–1.8 mm). *Adenophora stricta* subsp. *aurita* is distributed in northwestern Sichuan, allopatric with the distributional area of subspecies *sessilifolia*. The taxon is maintained at subspecies rank, being geographically distinct, yet its variability falls within the range of the species *A. stricta*.

5c. Adenophora stricta subsp. **confusa** (Nannf.) D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 105. 1983. Basionym: *Adenophora confusa* Nannf., Symb. Sin. 7(4): 1068. 1936. TYPE: China. Yunnan: "Yülung-schan bei Lidjiang" [Lijiang, Yulong Snow Range], s.d., *G. Forrest 6282* (holotype, E).

5d. Adenophora stricta subsp. **sessilifolia** D. Y. Hong, Fl. Reipubl. Popularis Sin. 73(2): 185. 1983. TYPE: China. Hubei: Lichuan, 23 Sep. 1957, *G. X. Fu & Z. S. Zhang 1580* (holotype, PE).

Adenophora stricta Miq. subsp. *henanica* P. F. Tu & G. J. Xu, J. China Pharm. Univ. 21(1): 17, fig. 1C. 1990, syn. nov. TYPE: China. Henan: Songxian, 1600 m, 15 Aug. 1987, *S. Y. Liu 87050* (holotype, CPU not seen).

Tu and Xu's (1990) *Adenophora stricta* subsp. *henanica*, described from Henan, China, appears to be exactly the same as *A. stricta* subsp. *sessilifolia* in every morphological aspect and is synonymized here.

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Léveillé, H. 1911. *Campanula chanetii* Levl. nov. spec. Repert. Spec. Regni Veg. 9: 45.

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Polystemma mirandae (Apocynaceae, Asclepiadoideae), una Nueva Especie de México

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RESUMEN. *Polystemma mirandae* Lozada-Pérez (Apocynaceae, Asclepiadoideae) se describe e ilustra de Guerrero, Oaxaca y Puebla, México. Esta nueva especie se caracteriza por el limbo y los lóbulos de la corola densamente estrigulosos en la superficie adaxial y por los lóbulos de la corona con dos apéndices laterales y aciculares. Se discute su relación con las especies del género.

ABSTRACT. *Polystemma mirandae* Lozada-Pérez (Apocynaceae, Asclepiadoideae) is described and illustrated from Guerrero, Oaxaca, and Puebla, Mexico. This new species is distinguished by the corolla limb and lobes densely strigillose on the adaxial surface and by the corona lobes with two lateral acicular appendages. Its relation with species of the genera is discussed.

Key words: Apocynaceae, Asclepiadoideae, Guerrero, IUCN Red List, Mexico, Oaxaca, *Polystemma*, Puebla.

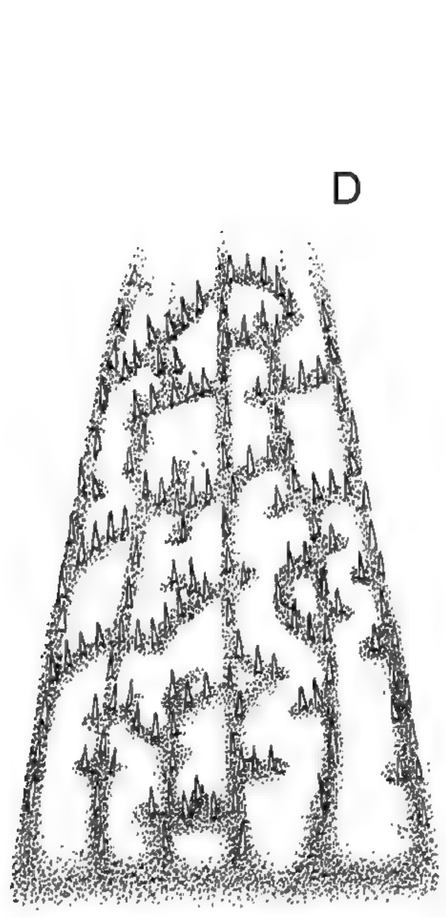
El género *Polystemma* Decne. (Apocynaceae, Asclepiadoideae), tradicionalmente considerado un subgénero en *Matelea* Aubl. (Woodson, 1941), ha sido objeto de modificaciones recientes. Stevens et al. (2001) restableció a *Polystemma* como un género válido y redujo las tres especies, que tradicionalmente se conocían para México, a sólo una, *P. viridiflorum* Decne. Posteriormente, Stevens (2005) adicionó *P. guatemalense* (Schltr.) W. D. Stevens (*Labidostelma guatemalense* Schltr.). Las especies del género se caracterizan por tener tricomas glandulares blancos y cristalinos en la madurez; corona ginostegial adnada a la corola, formada por cinco lóbulos opuestos a las anteras y unidos a la base del ginostegio, dentados y/o con apéndices en el ápice, cada lóbulo con una lígula interna, entera o dentada en el ápice; polinios más o menos horizontales, estériles y excavados en la base; estilo cóncavo en el ápice hasta capitado-apiculado; folículos angostamente fusiformes, simétricos, lisos y moteados; semillas obovadas, planas con margen prominente, comosas.

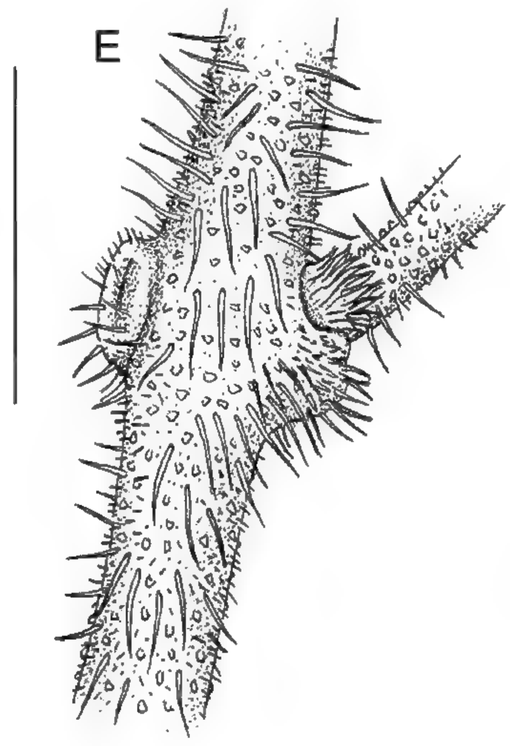
La nueva especie que aquí se describe se descubrió de especímenes colectados en la Cuenca del río Balsas en los estados de Guerrero, Oaxaca y Puebla, depositados en los herbarios FCME y MEXU de la Universidad Nacional Autónoma de México.

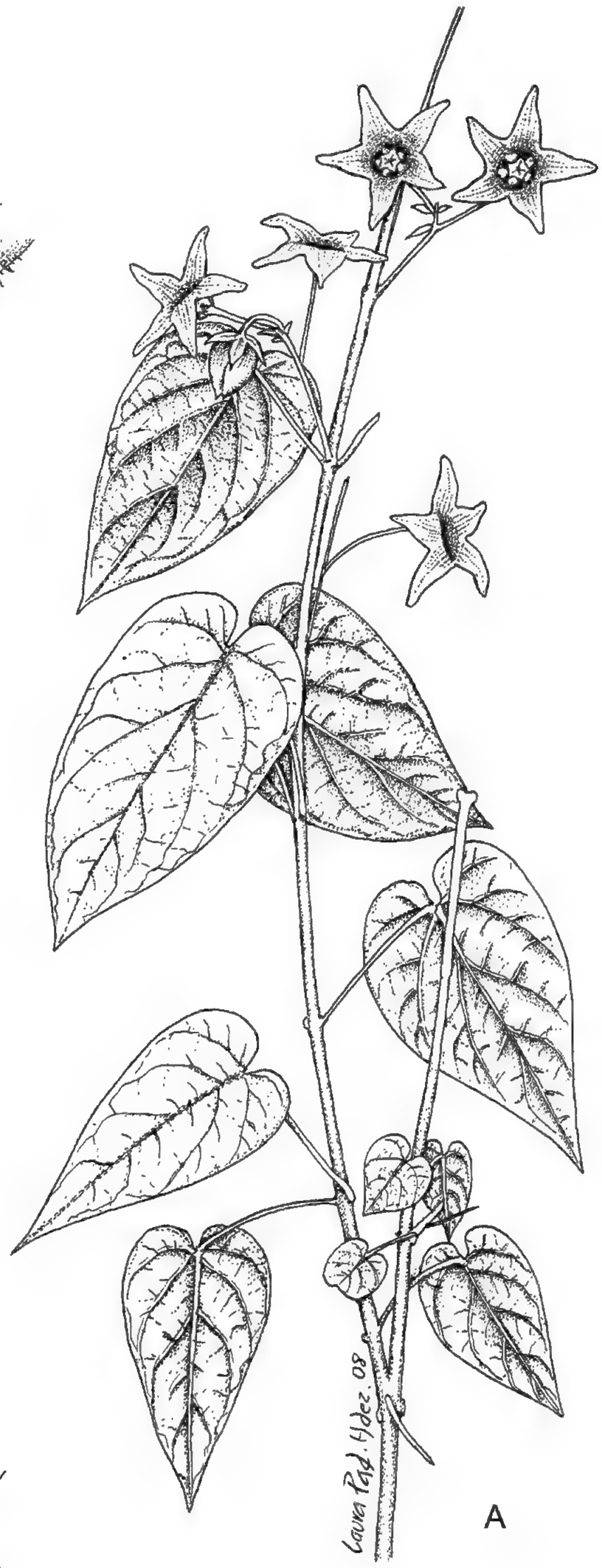
Polystemma mirandae Lozada-Pérez, sp. nov. TIPO: México. Guerrero: Mpio. Eduardo Neri, a 7.5 km de Mezcala, rumbo a Amatitlán, 15 jul. 1991, *M. Luna 136* (holotipo, FCME; isotipos, MEXU, MO). Figura 1.

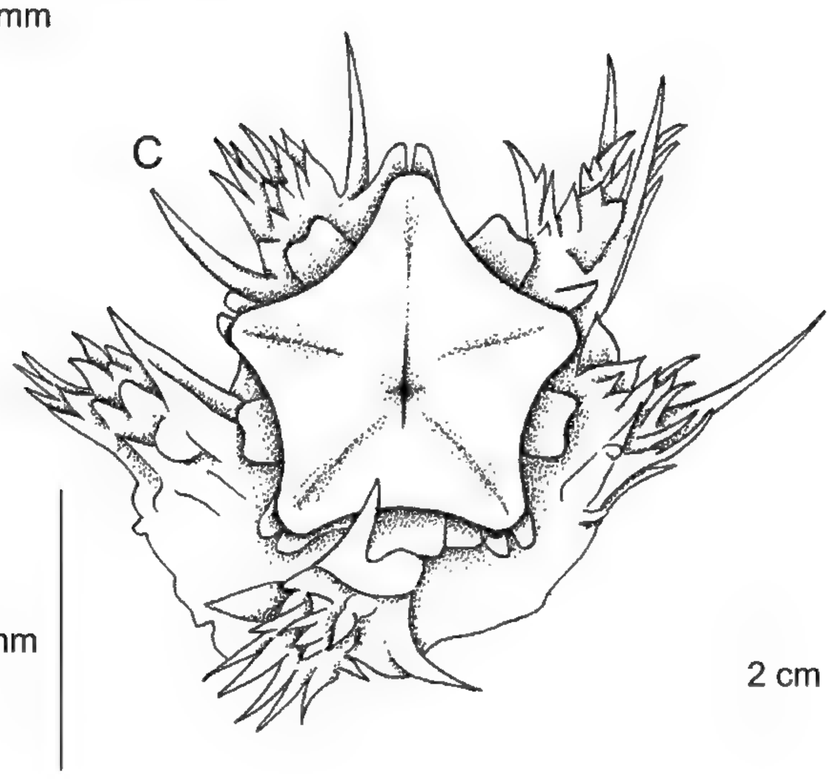
Haec species *Polystemmate viridifloro* Decne. affinis, sed ab eo limbo et lobulis corollae nervis dense strigulosis atque lobulis coronae appendicibus acicularibus (nec filamentosis) praeditis distinguitur.

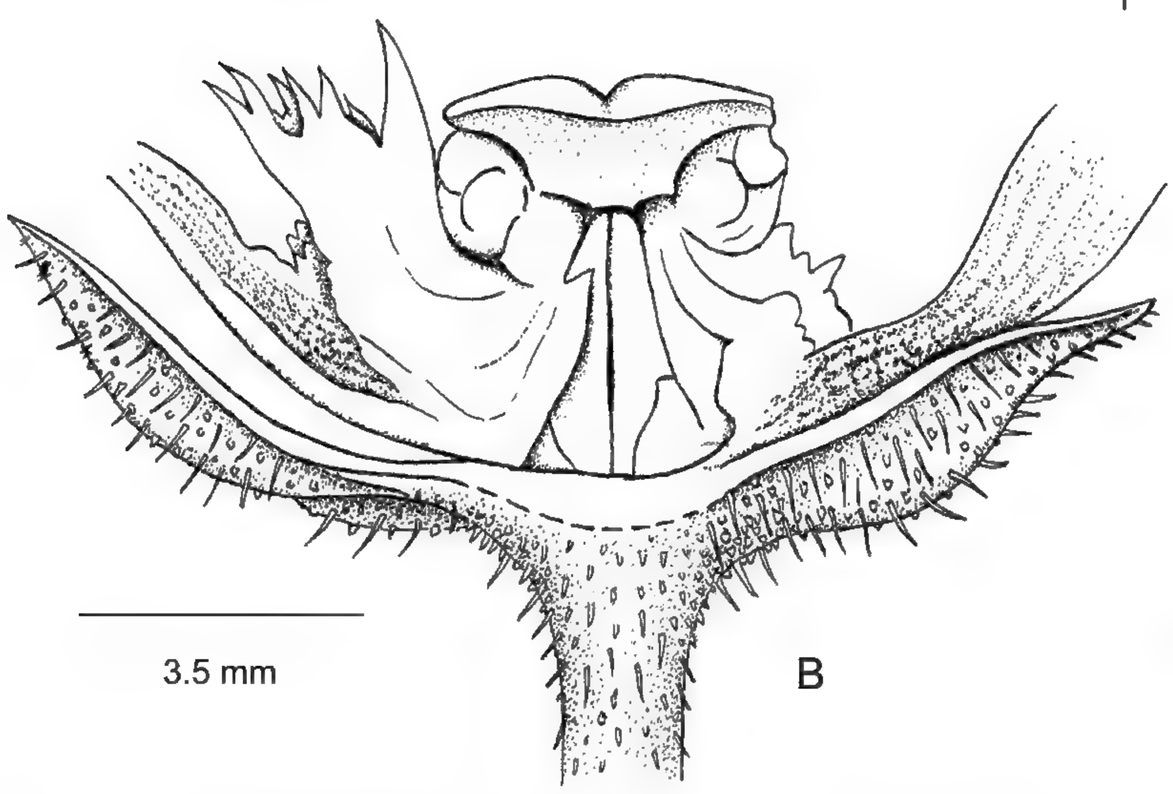
Plantas trepadoras leñosas o herbáceas, con látex blanco; tallos jóvenes con indumento mixto, tricomas largos de color amarillo pálido, translúcidos y septados, 0.5–0.8 mm, erectos, tricomas cortos translúcidos, ca. 0.1 mm, tricomas glandulares de color blanco, ca. 0.1 mm. Hojas opuestas, sin pseudoestípulas, láminas ovadas a estrechamente ovadas, 4.5–9 × 2.5–5 cm, ápice agudo a corto-acuminado, base lobada, lóbulos convergentes a traslapados, seno 5–12 mm de profundidad, haz con indumento mixto similar al tallo pero esparcido, el envés con indumento mixto concentrado principalmente en las nervaduras, nervios laterales 4 o 5 pares, los inferiores 2 ó más veces divididos, con 8 o 10 coléteres en la base de la lámina; pecíolos 3–4 cm, indumento mixto similar al tallo. Inflorescencia extra-axilar, 1 por nudo, racemiforme, generalmente con sólo 2 flores, indumento mixto similar al tallo; pedúnculos 2–2.5 cm, pedicelos 2–2.5 cm, brácteas lanceoladas, 4–6 × 1.5–2 mm, con indumento mixto en ambos lados. Cáliz con un tubo ca. 1.5 mm, con 1 coléter en la base a la altura de cada seno, lóbulos ovados a estrechamente ovados, patentes, 6–7 × 3.5–4 mm, ápice agudo, superficie abaxial con indumento mixto y denso, superficie adaxial densamente puberulenta; corola campanulada, estivación imbricada y dextrorsa, tubo de color púrpura oscuro, el limbo y los lóbulos de color café pálido y densamente reticulado-nervados adaxialmente, los nervios de color oscuro y estrigulosos, glabros en las partes











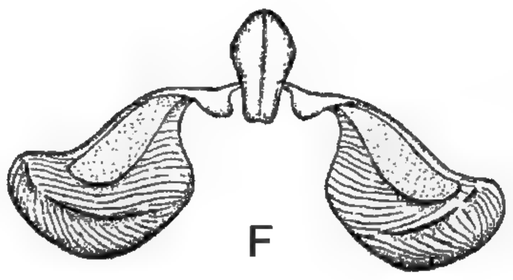


Figura 1. *Polystemma mirandae* Lozada-Pérez. —A. Rama con flores. —B. Flor en corte longitudinal mostrando en el centro los carpelos, el estilo en el ápice y un lóbulo de la corona en el lado izquierdo. —C. Vista apical del estilo y los lóbulos de la corona. —D. Lóbulo de la corola en vista adaxial mostrando los nervios y los tricomas. —E. Entrenudo con tricomas. —F. Polinios. Dibujo basado en el holotipo *M. Luna 136* (FCME).

sobrepuestas en botón, tubo 5–6 mm, el interior glabro y papiloso-rugoso, con densos tricomas cortos por fuera, limbo 2.5–3 mm, lóbulos estrechamente ovados, 14–17 × 7–7.5 mm, ápice obtuso, ligeramente emarginado, margen revoluto, corola densamente puberulenta abaxilamente, glabra en las partes sobrepuestas en botón; ginostegio sésil, corona ginostegial carnosa, de color púrpura oscuro, formada por 5 lóbulos erectos, opuestos y en contacto con las anteras, unidos entre sí y a la base de la corola por

una membrana undulado-pectinada en el ápice, los lóbulos rectangulares en contorno, ligeramente más estrechos en la base, ca. 2.5 × 1.5–1.8 mm, cada lóbulo con 2 apéndices laterales y aciculares, 1.5–1.7 × ca. 0.3 mm y entre ellos alrededor de 12 apéndices más pequeños unidos en 3 series, gradualmente más cortos hacia el interior, al final de esta serie y en contacto con la antera un apéndice ligulado, erecto, 0.8–1 × ca. 0.5 mm, ápice agudo a truncado-emarginado, entre los lóbulos de la corona se intercalan 5 nectarios cóncavos; apéndices terminales de las anteras reniformes y adpresos al ápice del estilo, ca. 0.5 mm; rieles guía divergentes hacia la base, ca. 0.3 mm; corpúsculo de color café, obovado, 0.35–0.4 × 0.2–0.25 mm, translator laminar, 0.32–0.33 × ca. 0.2 mm, polinios arriñonados, excavados y estériles en la base, 0.7–0.75 × 0.6–0.65 mm; estilo de color verde, ligeramente deprimido en el centro, 3–3.5 mm diám. Frutos y semillas no conocidos.

Distribución, hábitat y categoría de la Lista Roja de UICN. *Polystemma mirandae* es endémica de México, se conoce de los estados de Guerrero, Oaxaca y Puebla, en selvas secas y áreas perturbadas, entre los 1000 y 1300 m de altitud. La especie ha sido recolectada con flores sólo en tres ocasiones en los meses de julio y agosto de los años de 1940, 1991 y 2006. A pesar de lo llamativo y grande que son sus flores, la escasez de colectas permite suponer que la especie es sumamente rara y se puede encontrar en peligro de extinción. Debido a su distribución restringida, *P. mirandae* debe considerarse en la categoría de especies en peligro de la lista roja de UICN (UICN, 2001), según los siguientes criterios: EN B1ac(iii).

Etimología. Esta especie se nombra en honor de Faustino Miranda (1905–1964), iniciador de los estudios botánicos modernos en México y primer colector de la especie.

Discusión. *Polystemma mirandae* comparte con *P. viridiflorum* Decne. el tubo de la corola generalmente de color púrpura oscuro y rugoso, y los lóbulos densamente oscuro-reticulados, pero tiene el limbo y los lóbulos con los nervios densamente estrigulosos y cada lóbulo de la corona con dos apéndices laterales y aciculares; a diferencia de *P. viridiflorum* que tiene los lóbulos de la corola glabros o papilosos hacia el ápice y cada lóbulo de la corona con dos apéndices filamentosos. *Polystemma mirandae* ha sido confundida con *Matelea pilosa* (Benth.) Woodson, subgénero *Heliostemma* Woodson (Woodson, 1941), caracterizada por su corola subcampanulada rotada, completamente de color púrpura oscuro, de tal manera que los nervios son poco evidentes, puberulenta por dentro y la corona ginostegial de cinco segmentos más o menos carunculados.

Paratipos. MÉXICO. **Guerrero:** Mpio. Atenango del Río, 19.4 km al NE de Atenango, *M. Martínez 2624* (FCME). **Oaxaca:** Mpio. San Pedro Jaltepetongo, along Tomellín–Santa María Almoloya rd. 3 km N of San Pedro Jaltepetongo, *M. Fishbein, V. Juárez-Jaimes & L. Alvarado 5822* (MEXU). **Puebla:** Mun. Izúcar de Matamoros, *F. Miranda 2050* (MEXU).

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Una Nueva Especie de *Boyania* (Melastomataceae) de Colombia

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Resumen. Se describe e ilustra *Boyania colombiana* Humberto Mend. (Melastomataceae) procedente de una zona de suelos arenosos en el departamento de Caquetá, Colombia. Es una especie disyunta de un género monotípico que sólo se conocía para el Escudo Guayanés de Guyana. *Boyania colombiana* se distingue de *B. ayangannae* Wurdack por la forma de la base de la lámina foliar, pecíolos mayores de 2 cm, entrenudos muy cortos y ausencia de apéndice conectival dorsal. Se presentan datos de las diferencias de *B. colombiana* con otros géneros de la tribu Bertolonieae y se discute su posición genérica.

Abstract. *Boyania colombiana* Humberto Mend. (Melastomataceae) is described and illustrated from an area of sandy soils in the department of Caquetá, Colombia. It is a disjunct species in a monotypic genus known from the Guayana Shield in Guyana. *Boyania colombiana* is distinguished from *B. ayangannae* Wurdack by the shape of the leaf base, the petiole longer than 2 cm, the shortened internodes, and the absence of a dorsal connective appendix. *Boyania colombiana* is compared to other genera of the tribe Bertolonieae, and the generic position of the new species is discussed.

Key words: *Boyania*, Colombia, Guayana Shield, IUCN Red List, Melastomataceae.

Boyania Wurdack es un género monotípico hasta ahora conocido sólo del Escudo Guayanés de la Guyana. Pertenece a la tribu Bertolonieae (Melastomataceae) junto con otros géneros neotropicales de hierbas o sufrútices de frutos secos aristados o en forma de trompetilla como *Bertolonia* Raddi, *Diplarpea* Triana, *Macrocentrum* Hook. f., *Maguireanthus* Wurdack, *Monolena* Triana ex Benth. & Hook. f., *Salpinga* Mart. ex DC., *Triolena* Naudin y *Tryssophyton* Wurdack (Clausing & Renner, 2001). *Boyania* se reconoce por sus flores 5-meras, estambres isomórficos, conectivo de la antera con apéndices ventral y dorsal y el ovario súpero y 5-locular (Wurdack, 1964). No se conocía su presencia en Colombia, por lo que la especie que se describe a continuación representa una disyunción distribucional y se constituye en el registro más occidental del género.

Boyania colombiana Humberto Mend., sp. nov. TIPO: Colombia. Caquetá: Mpio. San Vicente del Caguán, carretera entre Neiva y San Vicente del Caguán, tramo río Pato, vereda Las Perlas a La Fonda (Mina Blanca), 270–300 m, 28 jul. 1990, *J. Betancur, J. C. Mejía & A. Wills 1913* (holotipo, HUA 086077; isotipo, HUA 084413). Figura 1.

Haec species a *Boyania ayangannae* Wurdack lamina foliari cordata, petiolo longiore, internodiis brevibus et connectivo ad basim dorsaliter non prolongato differt.

Hierbas estoloníferas terrestres o rupícolas, de 10–20 cm; pecíolos, tallos y nervadura por el envés pubescentes; tricomas sencillos retorcidos, de 3–5 mm, rufos; tallo 1–3 cm; entrenudos muy cortos generando la apariencia de hojas congestionadas saliendo de un mismo punto. Hojas opuestas, simétricas, similares en el mismo nudo; pecíolo 2–7 cm, 1–1.5 mm diám., ápice del pecíolo con tricomas glandulares diminutos y sésiles. Lámina foliar 5–9.5 × 4–9.5 cm, anchamente ovada o suborbicular, base cordada, ápice obtuso a redondeado, margen serrulado-ciliolada, textura papirácea, haz levemente rugosa, glabra, envés estrigoso en los nervios; venación con 3 o 4 pares de venas que acompañan a la vena media, basales; venas terciarias sobresalientes por el envés y formando retículos. Inflorescencia axilar, 1 o 3 por planta, 9–18 cm, largo-pedunculada, erecta, apicalmente dicasial con ramillas subescorpioides (la ramificación es tan corta que da la apariencia de ser umbeliforme) de 2–4 mm; 6 a 8 flores por inflorescencia; pedúnculo de la inflorescencia con ralos tricomas glandulares estipitados; brácteas en la base de las flores de 2–3 mm, lanceoladas y apicalmente setulosas, con diminutos tricomas glandulares sésiles. Flor bisexual, 1.2–1.5 cm incluyendo el pedicelo; pedicelo cuadrangular y de ángulos levemente aristados, 7–8 mm. Hipanto campanulado, 2.7–3 mm; externamente liso o levemente acostillado (8 o 10 costillas), con abundantes tricomas glandulares diminutos sésiles y ralos tricomas glandulares estipitados, encerrando el ovario pero no fusionado a éste; cáliz con lóbulos evidentes, interna y externamente con tricomas glandulares sésiles y diminutos; lóbulos 5, persis-

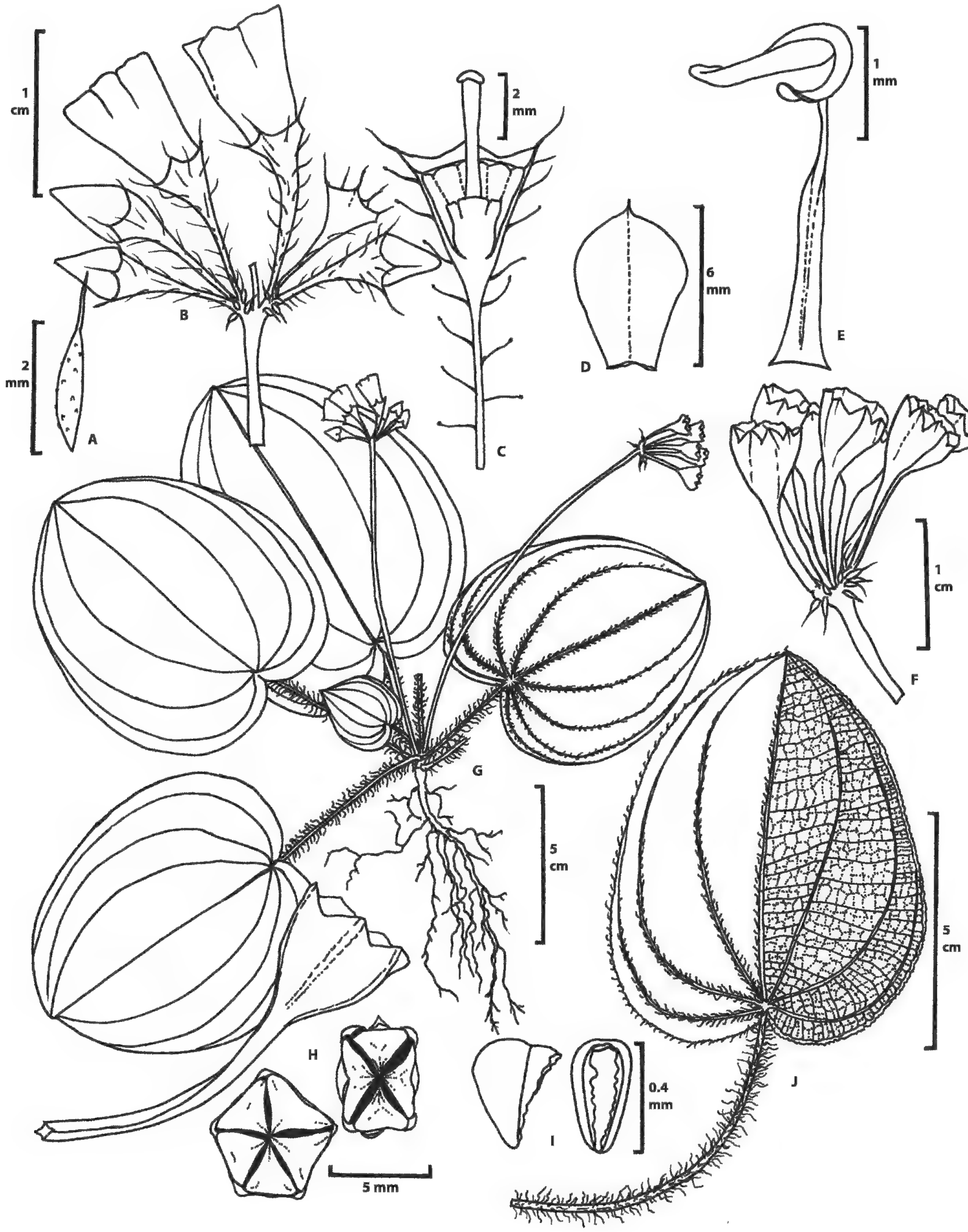

Figura 1. *Boyania colombiana* Humberto Mend. —A. Bráctea. —B. Ápice de la inflorescencia. —C. Corte del hipanto. —D. Pétalo. —E. Estambre. —F. Ápice de la infrutescencia. —G. Hábito. —H. Fruto en vista lateral (izquierdo) y superior (derecha). —I. Semilla. —J. Hoja. Ilustración basada en el holotipo *Betancur et al. 1913* (HUA).

tentes, ca. 0.5 mm, anchamente triangulares y apicalmente con una seta; corola patente; pétalos 5, de 6–7 × ca. 4.5 mm, estrechamente oblongos, apicalmente redondeados, de color blanco con lila, membranáceos; estambres isomórficos, filamentos 2.8–3 mm, delgados, teretes en la mitad superior y aplanados en la mitad inferior, glabros, antera subulada, curva ventralmente y lisa, con un poro apical-ventral, teca de 1.3–1.5 mm, conectivo levemente prolongado en la base ca. 3.3 mm, arqueado,

Tabla 1. Comparación de caracteres de *Boyania colombiana* con géneros de la tribu Bertolonieae (en sentido de Clausing & Renner, 2001). Caracteres tomados de Baumgratz (1989), Mendoza y Ramírez (2006) y Wurdack (1964, 1973).

Caracter	*B. colombiana*	*Boyania*	*Bertolonia*	*Diplarpea*
Desarrollo de estolones	si	si	si/no	no
Inflorescencia helicoide o con ramificación helicoide	si	si	si	si
Orientación del apéndice conectival	ventral	ventral y dorsal	dorsal	ventral
Número de pétalos	5	5	5	5
Posición del ovario (fusión con el hipanto)	súpero	súpero	súpero/fusionado parcialmente	súpero
Forma del fruto	pentagonal (cuadrangular)	—	triquetro	triquetro
Número de lóculos	5(4)	5	3(4)	3
Tricomas glandulares estipitados en el hipanto	si	si	si	no
Forma de la semilla	ovoide	—	ovoide/oblonga	ovoide
Superficie de la testa	lisa	—	tuberculada	tuberculada

apéndice ventral a manera de una lengua corta de 0.3 mm; ovario súpero, 4- o 5-locular, obovado, apicalmente con 4 o 5 alas triangulares; estilo ca. 4.3 × 0.3 mm, columnar, glabro; estigma 0.8–1 mm diám. Fruto cápsula septicida pentagonal o menos frecuente cuadrangular, 1.2–1.5 cm incluyendo el pedicelo, y 6–7 mm ancho, apicalmente con el techo del ovario conformado por 4 o 5 escudos; semillas abundantes, 0.3–0.5 mm, ovoides y lateralmente con un ribete membranoso; testa lisa, translúcida.

Distribución y hábitat. Conocida hasta el momento sólo del departamento de Caquetá, entre los 270 y 580 m de altitud. Estas localidades corresponden a lomeríos o zonas onduladas adyacentes al piedemonte oriental (vertiente amazónica) de la Cordillera Oriental. Los suelos son completamente arenosos con abundantes piedras redondeadas lo que indica que son producto de depósitos aluviales procedentes de la Cordillera Oriental.

Categoría de la Lista Roja de UICN. No se cuenta con mayor información para categorizar esta especie y además existen áreas inexploradas donde se podría encontrar otras poblaciones como por ejemplo La Sierra de La Macarena. Por esto se cataloga como Datos Insuficientes (DD) de acuerdo a la Lista Roja de UICN (UICN, 2001).

Etimología. El epíteto específico hace alusión al país de procedencia de la especie. *Boyania colombiana* es, hasta el momento, la única especie del género conocida para Colombia.

Discusión. La comparación de los principales caracteres de *Boyania colombiana* con otros géneros de Bertolonieae muestra que esta especie es disímil a la mayoría de los géneros de la tribu en caracteres del fruto y el ovario (Tabla 1). La tribu Bertolonieae Triana (Triana, 1865, 1871) ha sido recientemente replanteada con géneros restringidos al Neotrópico (Clausing & Renner, 2001). El tipo de fruto triquetro con tres lóculos, caracterizado por Baumgratz (1989) como bertolonidio, es el típico y representativo de la tribu aunque hay diferencias con los géneros *Macrocentrum* y *Salpinga* (Tabla 1).

Boyania colombiana se asemeja a algunas especies del género *Bertolonia*, pues comparte caracteres como la presencia de tricomas glandulares estipitados en el hipanto, la forma de la inflorescencia y la forma de las semillas. No obstante, presenta diferencias notables entre las que se encuentran: el ovario completamente súpero predominantemente 5-locular, el fruto pentagonal o menos frecuente cuadrangular, ausencia de apéndices conectivales dorsales y la testa de la semilla lisa (Tabla 1). Estas diferencias, en especial la forma del fruto y el número de lóculos, no permiten su ubicación en *Bertolonia*.

La ubicación de la especie descrita aquí en *Boyania* se ajusta por su hábito de crecimiento, forma de la inflorescencia, el desarrollo de un apéndice conectival ventral y el ovario 5-locular (Tabla 1). Posiblemente *Boyania ayangannae* Wurdack también presente frutos pentagonales similares a *B. colombiana*. Dentro de la tribu Bertolonieae, el conjunto de caracteres ovario 5-locular, frutos pentagonales y apéndice conectival ventral sólo se presenta, hasta el momento, en *B. ayangannae* y *B. colombiana*. *Boyania colombiana* se distingue de *B. ayangannae* Wurdack por la forma de la base de la lámina foliar, pecíolos mayores de 2 cm, entrenudos muy cortos y ausencia de apéndice conectival dorsal.

Tabla 1. Continuación.

Macrocentrum	*Maguireanthus*	*Monolena*	*Salpinga*	*Triolena*	*Tryssophyton*
no	si	no	no	no	si
no	si	si	si	si	no
dorsal	dorsal	ventral	dorsal	ventral	ventral
4 a 5	5	5	5	5	4
súpero	—	súpero	súpero	súpero/parcialmente fusionado	—
trompetilla	triquetro	triquetro	trompetilla	triquetro	—
3(2 a 4)	3	3	3	3	4
si	no	no	no	no	no
ovoide	—	ovoide	subcocleada	ovoide	—
tuberculada	tuberculada	rugosa	tuberculada	lisa/tuberculada	—

La distribución disyunta del género *Boyania* con esta nueva especie representa un enigma biogeográfico. Sin embargo, existe un caso similar con el género *Phainantha* Gleason de Melastomataceae, con representantes en el Escudo Guayanés de Venezuela y una especie disyunta de la Cordillera del Condor en los Andes de Ecuador (Ulloa & Neill, 2005). El lugar de procedencia de *B. colombiana* se encuentra cerca de la Serranía de La Macarena, que corresponde a la formación mas occidental del Escudo Guayanés (Etter, 2001). Aunque aún demanda de estudios florísticos detallados, se plantea que los lomeríos arenosos de donde procede *B. colombiana* tiene vínculos biogeográficos con las formaciones del Escudo Guayanés.

Paratipos. COLOMBIA. **Caquetá:** Mpio. Montañitas, reserva natural Las Dalias, 1°29′20″N, 75°39′59″, 377–385 m, 19 oct. 2009, *D. C. Rodríguez 27* (HUAZ); Mpio. Montañitas, corregimiento de Santuario, vereda Las Iglesias Bajas, finca Ceilan, reserva forestal de Itarca, 1°32.5′N, 75°28.2′W, 342 m, 21 may. 2005, *H. Manrique, M. Correa & E. Trujillo 7* (HUAZ); Mpio. San Vicente del Caguán, carretera entre Neiva y San Vicente del Caguán, afloramientos rocosos de roca siliciclásticas del Cretáceo, 580 m, 3 dic. 1990, *J. Betancur, S. Churchill & A. Wills 2357* (COL).

Material adicional revisado. Boyania ayangannae Wurdack. GUYANA. **Potaro-Siparuni:** Pakaraima Mtns., Mt. Wokomung, 5°4′N, 59°53′W, 1150–1200 m, *T. W. Henkel 4286, 4291, 4436* (CAS).

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A Synopsis of Neotropical *Stylogyne* (Myrsinaceae)

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Abstract. A complete list of accepted names for the Neotropical genus *Stylogyne* A. DC. (Myrsinaceae) comprises 35 species and two subspecies. The name *Stylogyne lateriflora* (Sw.) Mez is neotypified. The following 21 names are lectotypified: *Ardisia clusioides* Griseb., *A. hostmannii* Miq., *A. surinamensis* Miq., *Stylogyne amazonica* Mez, *S. atra* Mez, *S. balaensis* Mez, *S. canaliculata* (Lodd.) Mez, *S. depauperata* Mez, *S. flumensis* (Mez) Ricketson & Pipoly, *S. funckiana* Mez, *S. kappleri* Mez, *S. micans* Mez, *S. nigricans* (A. DC.) Mez, *S. pauciflora* Mez, *S. poeppigii* Mez, *S. sellowiana* Mez, *S. serpentina* Mez, *S. sordida* Mez, *S. spruceana* Mez, *S. venezuelana* Mez, and *S. warmingii* Mez. One error in the original protologue is corrected for *S. darienensis* Lundell. Two new combinations, *S. fluminensis* (Mez) Ricketson & Pipoly and *S. sublaevigata* (Kuntze) Ricketson & Pipoly, are made. Finally, 13 names are newly synonymized within *Stylogyne*.

Resumen. Se presenta una lista completa de los nombres aceptados para el género Neotropical *Stylogyne* A. DC., incluyendo a 35 especies y dos subespecies. Se neotipifica el binomio *Stylogyne lateriflora* (Sw.) Mez y se lectotipifican veintiun bionomios listados a continuación: *Ardisia clusioides* Griseb., *A. hostmannii* Miq., *A. surinamensis* Miq., *Stylogyne amazonica* Mez, *S. atra* Mez, *S. balaensis* Mez, *S. canaliculata* (Lodd.) Mez, *S. depauperata* Mez, *S. flumensis* (Mez) Ricketson & Pipoly, *S. funckiana* Mez, *S. kappleri* Mez, *S. micans* Mez, *S. nigricans* (A. DC.) Mez, *S. pauciflora* Mez, *S. poeppigii* Mez, *S. sellowiana* Mez, *S. serpentina* Mez, *S. sordida* Mez, *S. spruceana* Mez, *S. venezuelana* Mez y *S. warmingii* Mez. Se corrige un error dentro del protólogo de *S. darienensis* Lundell. Se propone dos nueva combinaciones, *S. fluminensis* (Mez) Ricketson & Pipoly y *S. sublaevigata* (Kuntze) Ricketson & Pipoly. Además, se relegan 13 bionomios a la sinoníma dentro del género *Stylogyne*.

Key words: Myrsinaceae, Neotropics, *Stylogyne*.

The Neotropical genus *Stylogyne* A. DC. (Myrsinaceae) comprises 35 species, with several others that remain undescribed owing to lack of adequate material. Sexual lability in the genus has been documented (Pipoly, 1989: 1, 1991: 202; Ricketson & Pipoly, 1997: 591), as well as correlated vegetative variation, which has caused taxonomic overdescription on numerous occasions. Circumscription of the genus *Stylogyne* has often been problematic due to significant quantitative floral and inflorescence heterogeneity among staminate, pistillate, and bisexual flowers and/or plants. Many species have been described in *Ardisia* Sw., *Geissanthus* Hook. f., or *Stylogyne* and then transferred among the three genera because of confusion in generic boundaries.

Stylogyne is unique among Neotropical genera of Myrsinaceae because of its contorted calyx and corolla lobes, with the corolla lobes variously twisted in bud. Another unique feature of the genus is that inflorescences in *Stylogyne* are either lateral (axillary) or pseudoterminal, rather than terminal as Mez (1901: 417, 1902: 264) and other authors (Lundell, 1971: 308) had suggested. Based on field observations and detailed examination of specimens, we have discovered that inflorescences formerly considered terminal are, in fact, pseudoterminal, with a small apical bud terminating the branchlet that becomes dormant while the inflorescence develops, subsequently resuming growth after the inflorescence senesces. This phenomenon has been confirmed in the field by Pipoly (pers. obs.) among several species of *Stylogyne*, such as *S. turbacensis* (Kunth) Mez, *S. nigricans* (A. DC.) Mez, *S. orinocensis* (Kunth) Mez, and *S. longifolia* (Mart.) Mez, while carrying out quantitative forest inventories and population studies. We have also seen this in numerous herbarium specimens, even though the apical bud has at times fallen off, leaving only a discernible apical bud scar. There is one species described by Mez, *Stylogyne ambigua*, that does have a fully terminal inflorescence, but we follow

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Agostini (1970: 403) in placing it in the genus *Geissanthus*.

Now that our treatment of the genus *Stylogyne* has been published for *Flora Mesoamericana* (Ricketson & Pipoly, 1997, 2009) and various major floristic checklists are underway (*Catálogo de las Plantas Vasculares de Colombia*; *Listado Florístico de Oaxaca*; *Catálago Anotado de la Flora del Departamento de Antioquia, Colombia*; *Catalogue of the Vascular Plants of Bolivia*), names in *Stylogyne* are needed by our colleagues in several countries for their own regional works. Given that it will be some time until a complete systematic monograph can be completed of the genus, we feel it is important to make the names accessible, typified when necessary, with any synonymies based on our current understanding.

Stylogyne A. DC., Ann. Sci. Nat., Bot., Ser. 2, 16: 78, 91. 1841. TYPE: *Stylogyne martiana* A. DC.

1. **Stylogyne aguarunana** Pipoly & Ricketson, Sida 19(2): 269–270, fig. 1. 2000. TYPE: Peru. Amazonas: Bagua Prov., Distr. Imaza, NW region of Río Marañón, Comun. Yamayakat, 04°55′S, 078°19′W, 320 m, 5 Aug. 1994 (fl.), *N. Jaramillo, A. Peña, R. Apanu & S. Katip 296* (holotype, MO; isotypes, BRIT, CPUN not seen, F).

2. **Stylogyne ardisioides** (Kunth) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 276. 1902. Basionym: *Myrsine ardisioides* Kunth, Nov. Gen. Sp. (H.B.K.) 3(11): 249. 1819. *Ardisia decipiens* A. DC., Prodr. 8: 125–126. 1844, nom. superfl. *Tinus ardisiodes* (Kunth) Kuntze, Revis. Gen. Pl. 2: 973. 1891. TYPE: Peru. "Crescit in Regno Peruviano," s.d. (fl., fr.), *A. von Humboldt & A. Bonpland s.n.* (holotype, P-Bonpl., P images as F neg. 38720, IDC no. 76/20/21, MO neg. s.n.).

Ardisia cauliflora Mart. & Miq., Fl. Bras. (Martius) 10: 291, tab. 35. 1856, syn. nov. *Stylogyne cauliflora* (Mart. & Miq.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 276. 1902. *Tinus cauliflorus* (Mart. & Miq.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Brazil. Amazonas: "Porto dos Miranhas Japurensis, Rio Negro," Jan. 1820 (fl.), *C. Martius s.n.* (holotype, M, M image as F neg. 20068).

Icacorea lateriflora Mart., Fl. Bras. 10: 291. 1856, nom. nud., non *Ardisia lateriflora* Sw., Prodr. (Swartz) 1: 48. 1788.

Stylogyne amplifolia J. F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 11(1): 33. 1931, syn. nov. TYPE: Peru. Loreto: Caballo-Cocha on Amazon River, Aug. 1929 (fl.), *L. Williams 2117* (holotype, F, F image as NY neg. 12131; isotype, US).

Rapanea pallens J. F. Macbr., Candollea 5: 397. 1934, syn. nov. TYPE: Peru. Loreto: Puerto Arturo, lower Río Huallaga, s.d. (fr.), *L. Williams 5330* (holotype, F, F image as NY neg. 12257).

Stylogyne gentryi Lundell, Wrightia 5(7): 240. 1976, syn. nov. TYPE: Ecuador. Los Ríos: Hac. Los Ocho, Km 50 on rd. from Santo Domingo to Quevado, 200 m, 4 Feb. 1974 (fl.), *A. Gentry 9639* (holotype, LL; isotype, MO).

3. **Stylogyne atra** Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 273. 1902. TYPE: Brazil. Amazonas: bei Manáos in Waldern, s.d. (fl.), *C. Schwacke 3671* (lectotype, designated here, GOET; isotype, B[†, 1943], B image as F neg. 4836).

Stylogyne spruceana Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 274. 1902. TYPE: Venezuela. Amazonas: "am Flusse Casiquiare," s.d. (fl.), *R. Spruce 3384* (lectotype, designated here, W; isotypes, BM, G-DC, G-DC image as F neg. 26705, K [2], NY, OXF, P, W).

Mez (1902: 273) listed two syntypes for *Stylogyne atra* "Hylaea: bei Barra am Rio Negro (Spruce n. 1435 et Catal. Monachii conscript. n. 1043), bei Manáos in Wäldren (Schwacke n. 3671, Ill. n. 248)" without mention of herbaria locations. Mez clearly used both collections in his circumscription of the taxon. The *Schwacke 3671* collection is in flower; the specimen at B included a detailed drawing of the floral parts, which was unfortunately destroyed in 1943 (Heipko, 1987). However, a sheet of *Schwacke 3671* has been located at GOET and is annotated by Mez. *Spruce 1435* is a mixed gathering of flowering material collected in April 1851 and fruiting material collected in October 1851. Although the material gathered in fruit of *Spruce 1435* is much more widely distributed, we prefer to select flowering material for this taxon. While we have located three flowering collections for *Spruce 1435*, only the W sheet was annotated by Mez; however, it is of much poorer quality than the *Schwacke 3671* collection at GOET. Therefore, we designate the GOET specimen (*Schwacke 3671*) as the lectotype.

Mez (1902: 274) listed only the *Spruce 3384* collection in the protologue for *Stylogyne spruceana*, but did not designate a location for the collection. If Mez had a duplicate of this collection at B, it was destroyed in 1943 (Heipko, 1987). A number of duplicates of *Spruce 3384* are available (BM, G-DC, K [2], NY, OXF, P, and W). The K [2], NY, OXF, and P sheets are eliminated from the selection of the lectotype because they apparently were not seen by Mez. Although annotated by Mez, the G-DC sheet, which was photographed by Macbride (F neg. 26705), consists of a single leaf blade without a petiole and two inflorescences and is eliminated as fragmentary. The BM and W sheets, both annotated by Mez, are essentially of equal quality, consisting of upper branchlets with a few detached inflorescences. We here select the W sheet as the lectotype over the BM sheet because it clearly shows the apical bud of the

branchlet and has more of the stem attached to the base of the inflorescence.

4. **Stylogyne bracteolata** (Lundell) Pipoly, Ernstia 53: 2. 1989. Basionym: *Cybianthus bracteolatus* Lundell, Wrightia 6(5): 114. 1980. TYPE: Peru. Amazonas: Condorcanqui Prov., Rio Cenepa Region, al lado de Huampami, monte, 800–850 ft. [244–259 m], 31 July 1974 (fl.), *R. Kayap 1409* (holotype, LL; isotype, MO).

5. **Stylogyne canaliculata** (Lodd., G. Lodd. & W. Lodd.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 268. 1902. Basionym: *Ardisia canaliculata* Lodd., G. Lodd. & W. Lodd., Bot. Cab. 11(4): tab. 1083. 1825. *Tinus canaliculatus* (Lodd., G. Lodd. & W. Lodd.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Grenada. A cultivated specimen obtained from John Ross and not likely preserved, s.d., *J. Ross s.n.* (lectotype, designated here, BM, tab. 1083 in Loddiges, 1825).

Ardisia clusioides Griseb., Fl. Brit. W. I. (Grisebach) 4: 396. 1861. TYPE: Dominica. s. loc., s.d. (fl.), *J. Imray s.n.* (lectotype, designated here, K).

Stylogyne braunii Mez, Symb. Antill. (Urban) 2(3): 417–418. 1901. TYPE. West Indies. Country unknown. Herbarium specimen from cultivated plant in Berlin Botanical Garden (holotype, B[†, 1943]).

Stylogyne smithiorum Mez, Symb. Antill. (Urban) 2(3): 418. 1901. TYPE: Dominica. s. loc., s.d. (fl.), *J. Imray s.n.* (lectotype, designated by Howard, 1989: 51, K).

Ardisia magdalenae Stehlé, Bull. Soc. Bot. France, Sér. 5, 108(9): 435. 1961. TYPE: France. Martinique: Montague du Vauchin, Sud de l'Île, 502 m, 8 Mar. 1939 (fl., fr.), *H. Stehlé 3728* (holotype, P; isotypes, US, W).

Loddiges et al. (1825: 1083) said of the Ross collection for *Stylogyne canaliculata*, "We received this plant several years since, from our excellent friend John Ross, Esq. of Grenada: it is now grown a handsome shrub." Although we have been unable to locate any original material, the authors do provide a limited description, "a handsone shrub, four or five feet in height; the leaves are nearly four inches in length, oval, and very rich green; the petioles are short, their upper surface remarkabli marginate and channelled; the under part round and smooth. The flowers are produced in terminal panicles, coming out in the winter season," in addition to a color plate, drawn from the original shrub and include the terms "Pentandria" and "Monogynia," as per the classification of the day. We designate the original George Cooke color plate (BM), No. 1083 in volume 11(4) of Conrad Loddiges & Sons, "The Botanical Cabinet: Consisting of coloured delineations of plants from all Countries, with a short account of each. Directions for management &c. &c.," as the lectotype for *S. canaliculata*.

Grisebach (1861: 396) listed four collections in his flora for his new species, *Ardisia clusioides*: "HAB. Jamaica!, Al. [Alexander Prior], Pd. [Purdie], March [March]; S. Anns, at Moneague, Westmoreland, in the mountains; Dominica, Imr. [Imray]." Although Grisebach worked at the Universität Göttingen (GOET), he relied heavily on the collection at K for his flora. According to Jochen Heinrichs (pers. comm.), curator of the Herbarium Göttingen, "Some years ago Goettingen scientists extensively checked our [GOET] holdings for Grisebach types, however, the entry regarding *Ardisia* in *Fl Brit. W. Ind.* is completely lacking." However, a single collection of *J. Imray s.n.* from Dominica is present at K and is labeled as *Ardisia clusioides*. We designate this sheet as the lectotype for *A. clusioides*.

The only material Mez (1901: 418) noted in his original description of *Stylogyne braunii* was from cultivated material grown "A. Braun temporibus in hort. Berol. culta" at the Berlin Botanical Garden, which noted only this for locality: "Patria ignota, verisimliter Antillae minores et ex affinitate intima speciei sequentis et ex nomie 'Ardisia tinifoliae' adscripto." In his monograph the next year, Mez (1902: 268) noted "Heimat unbekannt, wahrscheinlich Antillen. Früher im bot. Garten Berlin kultiviert (Herb. Berlin)." If any herbarium specimens were made and stored at B, they were unfortunately lost in 1943 (Hiepko, 1987). Although we have not seen any original material of *S. braunii*, the alleged differences noted by Mez (1902: 264) in his key ("Ovarium laeve" vs. "Ovarium valde punctatum") do not logically separate the species in our present understanding of the taxon, as punctation on ovaries varies widely. Based on Mez's (1901: 419, 1902: 268) description, at this time, we choose to refer *S. braunii* to *S. canaliculata*. It is interesting to note that Macbride did not photograph any material associated with this name while at Berlin. We can only speculate as to why this occurred, but perhaps it was due to the fact that no herbarium specimen was present at Berlin before the war. Clearly no material is currently present at B, and no additional material has been found. We suspect that the variation noted by Mez in both of his treatments of this species is due to the fact that the flowers were pistillate instead of staminate or bisexual, as has been observed in the original material of *S. canaliculata*. Thus, due to a lack of material we elect to defer lectotypification at this time.

6. **Stylogyne darienensis** Lundell, Wrightia 5(3): 68–69. 1974. TYPE: Panama. Darién: slopes of

Cerro Chucula, drainage of Río Pavarandó, 11 Feb. 1972 (fl.), *A. Gentry 4261* (holotype, LL; isotypes, BM, MO).

Lundell (1974: 69) erred in his original protologue when he cited the collection number as "*Al Gentry 4161*," which was collected as a Fabaceae. The correct collection number present on all known sheets is *4261*.

7. **Stylogyne depauperata** Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 277. 1902. *Ardisia depauperata* (Mez) Bernacci & Jung-Mend., Acta Bot. Bras. 14(3): 246. 2000. TYPE: Brazil. Rio de Janeiro: Rio de Janeiro, Tijuca, 29 Dec. 1869 (fl.), *A. Glaziou 4073* (lectotype, designated here, C; isotypes, B[†, 1943], B image as F neg. 4838, P [2]).

Stylogyne sellowiana Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 278. 1902, syn. nov. TYPE: Brazil. "Brésil," s.d. (fl.), *Lalande s.n.* (lectotype, designated here, P; isotype, B[†, 1943], B image as F neg. 4838).

Mez (1902: 277) listed five syntypes for *Stylogyne depauperata* (*Beyrich s.n.*, *Glaziou 4073*, *6631*, *14046*, *Widgren s.n.*) in his original description, but did not note the herbaria. No sheets of the *Beyrich s.n.* have been located. A single sheet of *Widgren s.n.* was located at S. Two sheets of *Glaziou 4073* as well as a single sheet each of *Glaziou 6631* and *14046* are present at P; however, none of the P material was annotated by Mez. A single sheet of *Glaziou 14046* is present at K and is annotated by Mez. At C, a single sheet of *Glaziou 14046* is present (but was not annotated by Mez); a specimen of *Glaziou 4073* is also present and was annotated by Mez. The *Glaziou 4073* sheet at C also contains three small drawings (flower bud, stamen, and sepal), presumably by Mez, directly on the sheet. The sheet of the *Glaziou 4073* collection at B was annotated by Mez as a "n. sp." and photographed by Macbride (F neg. 4838). The photograph includes a large drawing of the sepals, a petal, and a stamen in ventral and dorsal views; the original sheet and drawing were destroyed in 1943 (Hiepko, 1987). Clearly Mez used the *Glaziou 4073* collections at B for his description, but since that sheet was lost, the C duplicate with the small drawings is designated as the lectotype.

Mez (1902: 278) listed two syntypes for *Stylogyne sellowiana*, "Rio de Janeiro (*Sellow n. 2 [e.p.], Lalande*)—Berlin, Paris." The F neg. 4844 is of the *Sello*[*w*] *2 pt.* collection that was destroyed at B in 1943 (Hiepko, 1987). No other *Sellow n. 2 [e.p.]* material has been located either at B or P. The *Lalande s.n.* syntype at P is annotated by Mez and, since all B material was destroyed, the P sheet is designated as the lectotype.

8. **Stylogyne dusenii** Ricketson & Pipoly, Novon 19(4): 497, fig. 1. 2009. TYPE: Brazil. Paraná: Volta Grande, 19 Nov. 1911 (fl.), *P. Dusén s.n.* (holotype, GH; isotype, S not seen).

9. **Stylogyne fluminensis** (Mez) Ricketson & Pipoly, comb. nov. Basionym: *Ardisia fluminensis* Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 95–96. 1902. *Icacorea fluminensis* (Mez) Lundell, Phytologia 49(4): 348. 1981. TYPE: Brazil. Rio de Janeiro: Montoris Rio de Janerio, s.d. (fl.), *P. Lund s.n.* (lectotype, designated here, C; isotype, LL [fragm.]).

Stylogyne warmingii Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 278. 1902, syn. nov. *Ardisia warmingii* (Mez) Bernacci & Jung-Mend., Acta Bot. Bras. 14(3): 246. 2000. TYPE: Brazil. São Paulo: Lagoa Santa, 23 Dec. 1863 (fl.), *J. Warming 522* (lectotype, designated here, C, C image as F neg. 22971).

Mez (1902: 96) listed three syntypes for *Ardisia fluminensis*: "Ost-Brasilien: Staat Rio de Janeiro in der Serra dos Orgãos, bei Mandiocca (Lund, Mikan, Sellow n. 207).—(Herb. Berlin, Wien, Warming [C])." We have been unable to locate any material collected by Mikan associated with this taxon. The B sheet of the *Sellow 207* collection had a detailed drawing of the floral parts and was photographed by Macbride (F neg. 4878), but the sheet was destroyed in 1943 (Hiepko, 1987). A sheet of *P. Lund s.n.* is present at C [Hb. Warming], and we designate it as the lectotype.

Mez (1902: 278) listed three syntypes for *Stylogyne warmingii*: "Süd-Brasilien: Prov. São Paulo bei Lagoa Santa, San José de Río Pardo, Esp. Santo do Pinchal (Löfgren 1434, 3304, Warming 522).—Blüht November, Dezember.—Herb. Comm. geogr. geol. São Paulo, Warming." No material of *Löfgren 1434* or *3304* has been located. Imkhanitskaya (1996a: 29) previously lectoypified this taxon, but erroneously from the material present at LE. He states that the Warming collections arrived at LE unnumbered, and he specifically designates the unnumbered collection at C as the lectotype. However, Mez clearly states in his protologue that he used the *J. Warming 522* collection at C for his taxon. This sheet is still present at C and is annotated by Mez. We designate the *J. Warming 522* collection at C sheet as more consistent with the describing author's original intent.

10. **Stylogyne glomeruliflora** Cuatrec., Revista Acad. Colomb. Ci. Exact. 8(31): 326. 1951.

TYPE: Colombia. Valle del Cauca: Cordillera Occidental, vertiente occidental, hoya del río Dígua, Río San Juan, abajo de Queremal a la derecha del río entre Km 52 y 53, 1300–1500 m, 19 Mar. 1947 (fl.), *J. Cuatrecasas 23847* (holotype, F; isotypes, COL, US).

11. Stylogyne hayesii Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 272. 1902. TYPE: Panama. Darién: Manené [Manmer Station], Panama Railroad, 15 Oct. 1862 (fl.), *S. Hayes 662* (holotype, G-BOIS; isotypes, BM, K, P).

12. Stylogyne incognita Pipoly, Brittonia 51(2): 130, fig. 2. 1999. TYPE: French Guiana. Pied du Mont Galbao, crique Canal Panama, 03°37′N, 053°16′W, ca. 200 m, 7 Jan. 1986 (fl.), *J. de Granville, C. Feuillet, L. Hollenberg, O. Poncy & M. Sangrey 8401* (holotype, CAY; isotypes, B, MG not seen, MO, NY, P, U, US [2]).

13. Stylogyne indecora Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 277. 1902. *Ardisia cauliflora* Mart. & Miq. var. *parvifolia* Miq., Fl. Bras. (Martius) 10: 291. 1856. TYPE: Brazil. Pará: "in silvis prope urbem Pará, locis editioribus, s.d. (fl.), *C. Martius s.n.* (holotype, M, M image as F neg. 20069).

14. Stylogyne lasseri (Lundell) Pipoly, Ernstia 53: 4, fig. 1. 1989. Basionym: *Ardisia lasseri* Lundell, Wrightia 4(2): 59. 1968. *Icacorea lasseri* (Lundell) Lundell, Phytologia 49(4): 349. 1981. TYPE: Venezuela. Bolívar: selvas alrededor de Santa Elena, 1946 (fr.), *T. Lasser 1570* (holotype, VEN, VEN image as NY neg. 12106, LL neg. 1971-58A; isotypes, LL [fragm.], NY, US, VEN, VEN image as LL neg. 1971-58B).

15. Stylogyne lateriflora (Sw.) Mez, Symb. Antill. (Urban) 2(3): 418. 1901. Basionym: *Ardisia lateriflora* Sw., Prodr. (Swartz) 1: 48. 1788. *Anguillaria lateriflora* (Sw.) Lam., Tabl. Encycl. 4 (2): 109. 1797. *Anguillaria lateriflora* (Sw.) Poir., Encycl. 7: 687. 1806, nom. superfl. *Badula lateriflora* (Sw.) Griseb., Abh. Königl. Ges. Wiss. Göttingen 7: 237. 1857. *Tinus lateriflorus* (Sw.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Guadeloupe. Basse Terre: Bois des Basse-Terre, 490–950 m, 1892–1894 (fl.), *P. Duss 2283* (neotype, designated here, NY; isotypes, F, GH, NY [2], PH, US [2]).

Badula caribaea A. DC., Ann. Sci. Nat., Bot., Sér. 2, 16: 90. 1841. *Ardisia caribaea* (A. DC.) Miq., Fl. Bras. (Martius) 10: 289. 1856. *Tinus caribaeus* (A. DC.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: St. Vincent and the Grenadines. St. Vincent: s. loc., 1828 (fl.), *L. Guilding 14* (holotype, G-DC, G-DC images as IDC 1442/14, F neg. 33855, MO neg. s.n.).

Stylogyne tenuifolia Britton, Bull. Torrey Bot. Club 50(1): 53. 1923. TYPE: Trinidad and Tobago. Trinidad: Mt. Tocuche, 3–5 Apr. 1920 (fr.), *N. Britton, T. Hazen & W. Mendleson 1341* (holotype, GH; isotypes, NY, US).

The travels and history of the publication of Swartz's *Prodromus* (1788) were well documented by Stearn (1980), Howard and Howard (1982), and Nicolson and Jarvis (1990). Swartz (1788: 48) described five new *Ardisia* from the Caribbean. It has long been assumed that most of Swartz's new species were based on his own collections. However, Nicolson and Jarvis (1990: 622) paraphrase a statement made by Swartz as: "[m]y Prodromus is made up from my own collections and those in the Banksian herbarium. The new things that Solander identified and I had not collected are marked with an asterisk." A closer look at the entry by Swartz (1788: 48) for the new species *Ardisia lateriflora* reveals an asterisk (*) following the description, indicating that the concept of this species came from Solander's unpublished manuscript "Florula Indiae Occidentalis" and not from material collected by Swartz. In addition, Swartz cites the type locality simply as "India occidentalis" with no indication of collector. Nicolson and Jarvis (1990: 620) were able to translate most of Solander's manuscript and deciphered many of the cryptic notes. However, for the entry of this species, no detailed locality or collector information was discovered. Until now, most authors have accepted the idea that this species was based on an unnumbered Swartz collection housed at BM. Howard and Howard (1982) tried to lectotypify many of the names associated with the species in Swartz's *Prodromus* but were unable to resolve the type ambiguity for *A. lateriflora* Sw. Howard (1989: 52) indicated his uncertainty regarding this material when he stated, "Type: 'India occidentalis.' No specimens cited, but type should be in the Herb. Banks (BM)." At this time, no material that could be used as the type for the basionym, *Ardisia lateriflora* Sw., has been located either at BM or S (including the Swartz herbarium). We designate a collection of *Père Duss 2283* at NY as the neotype, because we think it best represents this taxon in the West Indies and it has numerous isotypes available. Finally, we here exclude two synonyms classically associated with this species (Mez, 1901: 419, 1902: 275), *Ardisia acuminata* Spreng. [= *Ardisia guyanensis* (Aubl.) Mez in Urb.] and *Anguillaria laurifolia* Lam. [= *Wallenia lamarckiana* (A. DC.) Mez in Urb.].

16. Stylogyne laxiflora Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 273. 1902. *Badula laxiflora*

Benth., in sched., in Mez, 1902: 273, nom. nud. Replacement synonym: *Ardisia spruceana* Carrijo, M. F. Freitas & Pexoto, Nordic J. Bot. 27: 454–455. 2009, non *Ardisia laxiflora* Merr., Philipp. J. Sci. 12: 153. 1917. TYPE: Brazil. "San Gabriel de Cachoeira am Rio Negro," s.d. (fl.), *R. Spruce 2173* (lectotype, designated by Carrijo et al., 2009: 454, NY [barcode 00329330]; isotypes, B[†, 1943], B image as F neg. 4839, BM, C, E, G, G-BOIS, G-DC, GOET, K [3], OXF, P [2], W [2]).

Mez (1902: 273) listed only the *Spruce 2173* collection for this taxon; however, he did not indicate at what institution he saw it. A number of sheets of the collection are present from numerous herbaria as noted above and most were annotated by Mez. According to Mez (1902: 273), the epithet is based on "*Badula laxiflora* Benth.! in plant. exsicc. Spruce 2173" apparently from an unpublished list or annotation, presumably by Bentham at K. The B holotype had an attached detailed drawing of the flower and was photographed by Macbride (F neg. 4839); however, that sheet was destroyed in 1943 (Hiepko, 1987). Carrijo et al. (2009: 454) lectotypified the name from the NY sheet, but there is no evidence that this sheet was seen by Mez. While we assert that the NY sheet is a poor choice, we must accept it as the lectotype according to the *International Code of Botanical Nomenclature* (McNeill et al., 2006: Art. 43). Carrijo et al. (2009: 454) misinterpreted statements of Pipoly and Ricketson (2005: 190) that most Neotropical *Ardisia* have filaments fused only basally, but free from the corolla. Fused filaments are not unique to *Ardisia*, but are rather common. What is unusual is that the filaments are fused to each other at the very base, but the entire androecium is free and not adnate to the corolla. In addition, the corolla lobes of *Stylogyne laxiflora* are contorted, clearly distinguishing the taxon from *Ardisia*.

17. Stylogyne leptantha (Miq.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 267. 1902. Basionym: *Ardisia leptantha* Miq., Fl. Bras. (Martius) 10: 286–287, tab. 32. 1856. *Tinus leptanthus* (Miq.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Brazil. Minas Gerais: central Brazil, s.d. (fl.), *J. Pohl s.n.* (holotype, M).

18. Stylogyne lhotskyana (A. DC.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 269. 1902, as "*lhotzkyana*." Basionym: *Ardisia lhotskyana* A. DC., Trans. Linn. Soc. London 17(1): 127. 1834, as "*lhotskya*." *Badula lhotskyana* (A. DC.) A. DC., Prodr. (DC.) 8: 111. 1844. *Tinus lhotzkyanus* (A. DC.) Kuntze, Revis. Gen. Pl. 2: 974. 1891, as "*lhotskya*." TYPE: Brazil. ca. Rio [de] Janeiro, 1832 (fl.), *J. Lhotsky s.n.* (holotype, G-DC, G-DC images as F neg. 7479, MO neg. s.n.).

19. Stylogyne longifolia (Mart.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 276. 1902. Basionym: *Ardisia longifolia* Mart., Fl. Bras. (Martius) 10: 290. 1856. *Tinus longifolius* (Mart.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Brazil. Amazonas: "crescit in silvis horrendis ditionis Japurensis," Jan. 1820 (fl.), *C. Martius s.n.* (holotype, M, M image as F neg. 20071).

20. Stylogyne martiana A. DC., Ann. Sci. Nat., Bot., Sér. 2, 16: 91. [Aug.] 1841. *Ardisia latipes* Mart., Herb. Fl. Bras. 570. 1841, nom. nud. *Ardisia latipes* Mart., Flora 24 (Beibl. 2): 62. [Sep.] 1841. *Tinus martianus* (A. DC.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. *Stylogyne latipes* (Mart.) Imkhan., Bot. Žhurn. (Moscow & Leningrad) 81(9): 32. 1996. TYPE: Brazil. "Ilheos in sylvis umbrosissimis," 1839 (fl.), *C. Martius 570* (holotype, G-DC, G images as F neg. 7477, MO neg. s.n.; isotypes, BM, G [Hb. Moricand], G-BOIS, GH, K, LE, M [2], NY, OXF, P, W [2]).

Much confusion has surrounded the type associated with the *C. Martius 570* collection, even as late as 1996 (Imkhanitskaya, 1996b: 32). According to Farr et al. (1979: 1700), in *Index Nominum Genericorum*, the publication date of Alphonse de Candolle's article in Ann. Sci. Nat., Bot., Sér. 2 (1841), which also described the genus *Stylogyne*, was August 1841. According to Stafleu and Cowan (1981: 333), Martius' (1841) article in Flora 24(Beibl. 2) was published on 21 September 1841. We believe this clearly gives priority to Alphonse de Candolle's taxa and *S. martiana* over the Martius name.

21. Stylogyne mathewsii Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 278. 1902. TYPE: Peru. Pangoa, s.d. (fl.), *M. Mathews 1200* (holotype, K [Hb. Benth.]; isotypes, E [2], K [Hb. Hook.], OXF).

Mez (1902: 278) listed only *Mathews 1200* from K for this taxon. However, there are two sheets of the collection at K, one in the Bentham herbarium and annotated by Mez as "*Ardisia ? mathewsii* n. sp." and the other in the Hooker herbarium, but not annotated by Mez. We assume then that Mez based this taxon on the Bentham herbarium sheet and not the Hooker herbarium sheet, and thus there is no need for lectotypification.

22. Stylogyne membranacea Pipoly, Ernstia 53: 6, fig. 2. 1989. TYPE: Venezuela. Táchira: Cerro Las Minas, 18 km SE of Santa Ana, pasture with forest along steep slopes leading to Cerro Azul of Cerro Las Minas, 07°36′N, 072°13′W, 1200–1380 m, 6 May 1981 (fl., fr.), *R. Liesner & M. Guariglia 11876* (holotype, VEN, VEN image as NY neg. 12105; isotypes, LL, MO, US).

23. Stylogyne micrantha (Kunth) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 276. 1902. Basionym: *Ardisia micrantha* Kunth, Nov. Gen. Sp. (H.B.K.) 3(11): 246. 1819. *Bumelia micrantha* (Kunth) Willd. ex Roem. & Schult., Syst. Veg., ed. 15 bis (Roemer & Schultes) 4: 802. 1819. *Tinus micranthus* (Kunth) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Colombia. "Crescit in ripa fluminis Magdalenae, prope Tenerife," Apr. (fl.), *A. von Humboldt & A. Bonpland 1471* (holotype, P-Bonpl., P image as MO neg. s.n.; isotypes, B-W [4606], B image as F neg. 4841, P).

Stylogyne venezuelana Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 273–274, fig. 45. 1902. TYPE: Venezuela. "Prope Coloniam Tovar," 1856–1857 (fl.), *A. Fendler 2355* (lectotype, designated here, K).

Stylogyne latifolia A. C. Sm., Lloydia 2(3): 203. 1939. TYPE: British Guiana [Guyana]. Basin of Essequibo River, near mouth of Onoro Creek, along river, 01°35′N, 15–24 Dec. 1937 (fr.), *A. C. Smith 2808* (holotype, NY; isotypes, MO, S, U, US).

Mez (1902: 274) listed two collections for the type of *Stylogyne venezuelana*, "Venezuela: bel Puerto-Cabellos (Karsten. n. 176), bei Tovar (Fendler n. 2355).—Herb. Berlin, Boiss.-Barbey, DC., A. Gray, Wien." The syntypic material for this name is questionable. Obviously any of the material Mez used at B was destroyed in 1943 (Heipko, 1987). This possibly includes the material used for the illustration in the protologue (Mez, 1902: 274, fig. 45). At W is a sheet annotated by Mez as "*Stylogyne venezuelana* n. sp.," from "Colonia Tovar," but without further determination to collector name or number, although the date and location are not inconsistent with a Fendler collection. At G, also annotated by Mez as "*Stylogyne venezuelana* n. sp.," are two *Karsten* collections (G-BOIS and G-DC), but both sheets are numbered as "*a*" and not "*176*" as in the original protologue. A search of the collections at GH has failed to reveal either syntype. There is a specimen of the *Fendler 2355* collection at K, unfortunately not annotated by Mez. However, given the ambiguity of the G and W material we designate the K material as the lectotype.

24. Stylogyne minutiflora Cuatrec., Revista Acad. Colomb. Ci. Exact. 8(31): 326. 1951. TYPE: Colombia. Boyacá: Region of Mt. Chapón, NW of Bogotá, extreme W part of Dept. Boyaca, 3600 ft. [1097 m], 22 May 1932 (fl.), *A. Lawrance 86* (holotype, F, F image as NY neg. 12124; isotypes, A, COL, LL, NY, UC, US).

25. Stylogyne nigricans (A. DC.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 267. 1902. Basionym: *Badula nigricans* A. DC., Ann. Sci. Nat., Bot., Sér. 2, 16: 90–91. 1841. *Ardisia nigricans* (A. DC.) Miq., Fl. Bras. (Martius) 10: 289–290. 1856. *Tinus nigricans* (A. DC.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Brazil. "Fluvium Nigrum" [Rio Negro], s.d. (fl.), *s. coll.* (lectotype, designated here, P).

Ardisia panurensis Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 95. 1902, syn. nov. *Icacorea panurensis* (Mez) Lundell, Phytologia 49(4): 350. 1981. TYPE: Brazil [as Pará]. Amazonas: "prope Panurè ad Río Uaupès," Oct. 1852–Jan. 1853 (fl.), *R. Spruce 2542* (holotype, G-DC, G image as F neg. 26667; isotypes, B[†, 1943], BM, G-BOIS, K, OXF, P).

Stylogyne brunnescens Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 267. 1902, syn. nov. TYPE: Brazil. Amazonas: Panurè am Río Uaupès," s.d. (fl.), *R. Spruce 2665* (holotype, G [Hb. Deless.], G image as F neg. 26702; isotypes, GH, K, P).

In Alphonse de Candolle's (1841: 91) description of *Badula nigricans*, he listed two collections "Hab. circa Para et ad fluvium Nigrum (Rio Negro)" both in "(V. in h. Mus. Par.)," both collections are still present at P. The Pará collection, if ever fertile, is now sterile. Thus we designate the Rio Negro collection, which is flowering, as the lectotype.

26. Stylogyne orinocensis (Kunth) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 270. 1902. Basionym: *Ardisia orinocensis* Kunth, Nov. Gen. Sp. [H.B.K.] 3(12): 244. 1819. *Tinus orinocensis* (Kunth) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Venezuela. "Crescit ad ripam Orinoci, inter cataractas Aturensium et pagum San Borja," May (fl.), *A. von Humboldt & A. Bonpland 842* (holotype, P-Bonpl., P image as MO neg. s.n.; isotypes, B[†, 1943], B image as F neg. 4842, B-W [2]).

Badula schomburgkiana A. DC., Ann. Sci. Nat., Bot., Sér. 2, 16: 90. 1841, syn. nov. *Ardisia schomburgkiana* (A. DC.) Miq., Fl. Bras. (Martius) 10: 289. 1856. *Tinus schomburgkianus* (A. DC.) Kuntze, Revis. Gen. Pl. 2: 975. 1891. *Stylogyne schomburgkiana* (A. DC.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 270. 1902. TYPE: Guyana. s. loc., 1837 (fl.), *R. Schomburgk 306* (holotype, G-DC; isotypes, BM, G-BOIS, G [Hb. Deless.], K, U, US, W).

Badula schomburgkiana A. DC. var. *brasiliensis* A. DC., Prodr. (DC.) 8: 111. 1844, syn. nov. *Stylogyne*

brasiliensis (A. DC.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 269. 1902. TYPE: Brazil. s. loc., s.d. (fl.), *s. coll. s.n.* (holotype, P).

Ardisia surinamensis Miq., Fl. Bras. (Martius) 10: 288. 1856. *Stylogyne surinamensis* (Miq.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 271. 1902. *Tinus surinamensis* (Miq.) Kuntze, Revis. Gen. Pl. 2: 975. 1891. TYPE: Suriname. "Crescit in Suriname...In Brasilia amazonica detegenda," 1843 (fl.), *F. Hostmann 617* (lectotype, designated here, G [Hb. Deless.], G image as F neg. 26706; isotypes, BM, C, G-BOIS, K [2], P, W [4]).

Ardisia hostmannii Miq., Fl. Bras. (Martius) 10: 288. 1856, as "*hostmanni*." *Tinus hostmannii* (Miq.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. TYPE: Suriname. "Crescit in Suriname," 1840–1843 (fl.), *F. Hostmann 166* (lectotype, designated here, K [Benth.]; isotypes, BM [2], G [Hb. Deless.], G-BOIS, K [Hb. Hook.], P, W [3]).

Stylogyne micans Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 272–273. 1902. TYPE: Suriname. "Am Lava-Fluss," s.d. (fl.), *A. Kappler & F. Hostermann 2106* (lectotype, designated here, W; isotypes, G-DC, GOET, P, W).

Stylogyne poeppigii Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 274–275. 1902, syn. nov. TYPE: Brazil. Amazonas: Ega [Teffé], Dec. 1831 (fl.), *E. Poeppig 2887* (lectotype, designated here, W, W image as F neg. 31983; isotypes, B[†, 1943], W [2]).

Stylogyne amazonica Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 275. 1902. TYPE: Brazil. Amazonas: "San Gabriel da Cachoeira am Rio Negro," s.d. (fl.), *R. Spruce 2200* (lectotype, designated here, K; isotypes, BM, C, C image as F neg. 22980, E, G-BOIS, G-DC, G [Hb. Deless.], G image as MO neg. s.n., GH, GOET, K [2], NY, P [2], W [2]).

Stylogyne kappleri Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 275. 1902. TYPE: Dutch Guyana [Suriname]. Paramaribo: Mar.–Apr. (fl.), *A. Kappler 1633* (lectotype, designated here, G-BOIS; isotypes, G [Hb. Deless.], G image as F neg. 26703, GOET, MO, P [4], W).

Martius and Miquel (1856: 288) published the names *Ardisia surinamensis* and *A. hostmannii*, with reference only to the country. For the type of *A. surinamensis*, we designate the G sheet in the Delessert collection as the lectotype, because it is associated with a Macbride type photograph at F, which was widely distributed and is readily available.

The Hostmann collections were widely distributed, and all the material is more or less of equal value. For the type of *Ardisia hostmannii*, we designate the material at K from the Bentham herbarium as the lectotype, because it is the best sheet of the gathering.

Mez (1902: 273) listed two different collections and three different herbaria for the type of *Stylogyne micans*: "Holländisch-Guyana: am Lava-Fluss; Französisch-Guyana: ohne Standortsanfabe (Kappler n. 2106, Moricand n. 10)—Blüht im October. (Herb. DC., Goetting., Wien.)." All the material of *Moricand 10* we have observed (G [2], NY) is of poor quality, with small inflorescences and poorly pressed leaves. The *Kappler 2106* collections from G-DC, GOET, P, and W are of much better quality. The specimen at W is of fine quality and we designate it as lectotype.

Mez (1902: 275) listed only the *Poeppig 2887* collections from B and W for his *Stylogyne poeppigii*. The B material was destroyed in 1943 (Heipko, 1987). However, three sheets of this collection are present at W, two of which were annotated by Mez. We designate the annotated sheet photographed by Macbride (F neg. 31983), without accession number by W, as the lectotype.

Mez (1902: 275) listed only the *R. Spruce 2200* collection for the type of *Stylogyne amazonica*, but failed to indicate any herbarium of deposit. Although the type material was widely distributed, the most significant Spruce collections are at K and therefore we designate the K sheet as the lectotype.

Mez (1902: 275) listed only the *A. Kappler 1633* collections for the type of *Stylogyne kappleri* from "Herb. Boiss.-Barbey, Deless., Wien." All this material is available, but the G-BOIS sheet is by far the better sheet and we designate it as the lectotype.

27. Stylogyne pauciflora Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 278–279. 1902. TYPE: Brazil. São Paulo: s. loc., s.d. (fl.), *H. Sello*[*w*] *472* (lectotype, designated here, B, B image as B neg. 96121; isotypes, B, B image as B neg. 96120, B[†, 1943], B image as F neg. 4843).

Ardisia handroi Toledo, Loefgrenia 39: 2. 1969, syn. nov. TYPE: Brazil. São Paulo: São Paulo, "nativa no Parque do Estado e Jardim Botânico," 30 Oct. 1935 (fl.), *O. Handro s.n.* (holotype, SP not seen; isotypes, HB not seen, NY, SI not seen, US).

Mez (1902: 279) listed two syntypes for *Stylogyne pauciflora*, from "Süd-Brasilien: Säo Paulo ohne Standorsangabe (*Gaudichaud s.n., Sellow 472*)—Herb. Berlin, Paris." A sheet of *C. Gaudichaud* from São Paulo is present at P, with an annotation by Mez. However, it is labeled as "*Herbier Impérial Brésil 36*," and it remains unclear if this is the material Mez cited in his protologue. Because of the confusion of this material, it is eliminated as a possible lectotype. Macbride photographed a specimen of *Sellow 472* at B (F neg. 4843), which was annotated by Mez and had a large drawing of the floral parts; however, that sheet was destroyed in 1943 (Hiepko, 1987). Fortunately, two sheets annotated by Mez of *Sellow 472* are still held at B, and both of these sheets match the destroyed B material; unfortunately, neither has any additional locality data. The B sheet, as imaged by B neg. 96121, is by far the best sheet and is designated as the lectotype.

28. Stylogyne pucuroensis Ricketson & Pipoly, Sida 20(3): 919, fig. 1. 2003. TYPE: Panama.

Darién: Parque Nac. del Darién, ridge betw. N & S branches of Río Pucuro, in forest N of old village of Tacarcuna, ca. 18 km E of Pucuro, 08°05′N, 077°16′W, 600–800 m, 24 Oct. 1987 (fr.), *B. Hammel, G. de Nevers, H. Cuadros V. & H. Herrera 16469* (holotype, MO; isotypes, BRIT, LL, PMA).

29. Stylogyne racemiflora Ricketson & Pipoly, Novon 19(4): 499, fig. 2. 2009. TYPE: Brazil. Amazonas: Mpio. São Gabriel da Cachoeira, Morro dos Seis Lagos, Lago do Dragão, 400–450 m, 14–15 Oct. 1987 (fl.), *C. Farney, D. Daly, D. Stevenson, J. Oliveira & R. de Lima 1705* (holotype, MO; isotypes, GH, INPA not seen, K, MO, NY, US).

30. Stylogyne rodriguesiana Pipoly, Novon 1(4): 202, fig. 1. 1991. TYPE: Brazil. Amazonas: Manaus, Igarapé do Cachoira, Alta de Taruma, 4 Aug. 1961 (fl.), *W. Rodríguez & F. Chagas 3092* (holotype, INPA; isotype, NY).

31. Stylogyne serpentina Mez, Repert. Spec. Nov. Regni Veg. 16(468–473): 420–421. 1920. TYPE: Brazil. Acre: Rio Acre, Seringal Auristella, May 1911 (fl.), *E. Ule 9688* (lectotype, designated here, K; isotypes, B[†, 1943], B image as F neg. 4845, L, NY).

Rapanea chartacea J. F. Macbr., Candollea 5: 396. 1934, syn. nov. *Stylogyne chartacea* (J. F. Macbr.) J. F. Macbr., Publ. Field Mus. Nat. Hist., Bot. Ser. 13(5/1): 194. 1959. TYPE: Peru. Loreto: Maynas Prov., Iquitos, 120 m, Mar.–Apr. 1930 (fl. bud), *L. Williams 8049* (holotype, F, F image as NY neg. 12126; isotype, US).

Mez (1920: 421) listed only the *Ule 9688* collection in the protologue without specifying a location. The sheet of *Ule 9688* housed at Berlin was photographed by Macbride (F neg. 4845) and clearly shows Mez's annotation, but this was destroyed in 1943 (Hiepko, 1987). Among the remaining isotypes at L, K, and NY, none were annotated by Mez; however, they all correspond to the F image of the B specimen. We designate the K sheet as the lectotype, because it is a higher quality specimen with critical vegetative and floral parts more evident than seen on the other sheets.

32. Stylogyne sordida Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 277. 1902. TYPE: Brazil. Prov. de Rio de Janeiro, voyage d'Auguste, 1816–1821 (fl.), *Saint Hilaire A¹ 560* (lectotype, designated here, P; isotypes, B[†, 1943], B image as F neg. 4846, P).

Mez (1902: 277) listed two syntypes for *Stylogyne sordida*, from Rio de Janeiro "(Saint-Hilaire A¹ n. 560 and Sellow n. 2 [e.p.])—Herb. Berlin, Paris." The B sheet of the *Sello*[*w*] *2* collection annotated by Mez had a detailed drawing of the floral parts and was photographed by Macbride (F neg. 4846), but the sheet was destroyed in 1943 (Hiepko, 1987). At this time no other material of the *Sello*[*w*] collection has been located. If a sheet of *Saint-Hilaire A¹ n. 560* was ever present at B, it also was lost in 1943. However, two sheets of the *Saint-Hilaire A¹ n. 560* collection are at P; one was not annotated by Mez and is a much poorer specimen. The other P collection of *Saint-Hilaire A¹ n. 560* is of higher quality and is annotated by Mez; we designated it as the lectotype.

33. Stylogyne sublaevigata (Kuntze) Ricketson & Pipoly, comb. nov. Basionym: *Ardisia martiana* Miq., Fl. Bras. (Martius) 10: 285, tab. 30. 1856. *Icacorea laevigata* Mart. & Miq., Fl. Bras. (Martius) 10: 285. 1856, nom. nud. Replacement synonym: *Tinus sublaevigatus* Kuntze, Revis. Gen. Pl. 2: 974. 1891, non *Stylogyne martiana* A. DC., Ann. Sci. Nat., Bot., Sér. 2, 16: 91. 1841. *Stylogyne laevigata* Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 266–267. 1902, nom. illeg. TYPE: Brazil. "Crescit in nemoribus perpetuis prov. Sebastianopolitanae prope praedium Mandioccam, Río de Janiero," Sep. (fl.), *C. Martius s.n.* (holotype, M, M image as F neg. 20070).

34. Stylogyne turbacensis (Kunth) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 270. 1902. Basionym: *Ardisia turbacensis* Kunth, Nov. Gen. Sp. (H.B.K.) 3(12): 245–246. 1819. *Tinus turbacensis* (Kunth) Kuntze, Revis. Gen. Pl. 2: 975. 1891. TYPE: Colombia. Antioquia: Turbo Mpio., near Turbaco [Turbo], s.d. (fr.), *A. von Humboldt & A. Bonpland 1446* (holotype, P-Bonpl.; isotype, P).

34a. Stylogyne turbacensis subsp. **laevis** (Oerst.) Ricketson & Pipoly, Sida 17(3): 595. 1997. Basionym: *Ardisia laevis* Oerst., Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn, Ser. 2, 1861(8–9): 125. 1862. *Tinus laevis* (Oerst.) Kuntze, Revis. Gen. Pl. 2: 974. 1891. *Stylogyne laevis* (Oerst.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 268. 1902. TYPE: Costa Rica. Cartago: Monte Irasu [Irazú], Jan. 1847 (fl.), *A. Oersted 28* (lectotype, designated by Lundell, 1966: 199, C).

Ardisia ramiflora Oerst., Vidensk. Meddel. Naturhist. Foren. Kjøbenhavn, Ser. 2, 1861(8–9): 132–133, t. 2, f. 35–38. 1862. *Tinus ramiflorus* (Oerst.) Kuntze, Revis. Gen. Pl. 2: 975. 1891. *Stylogyne ramiflora* (Oerst.) Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 272. 1902. TYPE:

Nicaragua. Zelaya: Prope Tortuga, Apr. 1847 (fl.), *A. Oersted 31* (lectotype, designated by Lundell [1966: 199], C, C image as F neg. 22970).

Ardisia guatemalensis Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 92. 1902. TYPE: Nicaragua. Chontales: [non "Guatmala, Aioyapa," Mez, 1902: 92], Acoyapa, 15 Feb. 1841 (fr.), *E. von Friedrichsthal 857* (holotype, W).

Stylogyne reticulata Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 269. 1902. TYPE: Colombia. Cauca: Popayan Mpio., near Popayán, s.d. (fl.), *J. Goudot s.n.* (holotype, P).

Stylogyne funckiana Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 271. 1902. TYPE: Venezuela. Carácas in the Nahe von Guareras, 1000 m, Mar. 1843 (fl.), *H. Funck & L. Schlim 456* (lectotype, designated here, P; isotypes, BM, G, G-BOIS, P, W, W image as F neg. 21982).

Stylogyne nicaraguensis Lundell, Wrightia 3(6): 110. 1964. TYPE: Nicaragua. Zelaya: Breñales espesos de La Esperanza, Río Grande, 0–15 m, 10 abr. 1949 (fl.), *A. Molina R. 2125* (holotype, F).

Stylogyne standleyi Lundell, Wrightia 3(6): 110. 1964. TYPE: Panama. Canal Area: Barro Colorado Island in Gatún Lake, ca. 120 m, 18–24 Nov. 1925 (fl.), *P. Standley 41048* (holotype, US; isotype, BM).

Mez (1902: 271) listed one collection (*H. Funck & L. Schlim 456*) from two herbaria (G-BOIS and P) for his type of *Stylogyne funckiana*. Fortunately, all these sheets are present and they are of more or less equal quality. It should be noted that two sheets of *H. Funck & L. Schlim 456* are present at P; one is annotated by Mez, while the other is not and is eliminated as a lectotype candidate. It should also be noted that a sheet of this type is present in the general collection at G, but likewise was not annotated by Mez and is eliminated as a lectotype candidate. We designate the G-BOIS collection as the lectotype for this taxon, because it was annotated by Mez in 1901 and is of slightly better quality, primarily because it possesses an apical shoot.

34b. Stylogyne turbacensis subsp. **turbacensis.**

Cissus pentandra Willd. ex Schult. & Schult. f., Mant. 3 (Schultes & Schultes f.) 3: 248. 1827. TYPE: Colombia. s. loc., 1799–1804 (fl.), *A. von Humboldt & A. Bonpland 1446* (holotype, B-W 3005).

Stylogyne balaensis Mez, Pflanzenr. (Engler) IV, 236(Heft 9): 271. 1902. TYPE: Ecuador. Guayas: Balao Cantón, bei Balao in Wäldern, Dec. (fl.), *H. Eggers 14304* (lectotype, designated here, M; isotype, US).

Icacorea granatensis Rusby, Descr. S. Amer. Pl. 79–80. 1920. Replacement synonym: *Ardisia rusbyana* Standl., Publ. Field Mus. Nat. Hist., Bot. Ser. 4(8): 250. 1929. *Icacorea rusbyana* (Standl.) Lundell, Phytologia 49(4): 351. 1981. TYPE: Colombia. Magdalena: Santa Marta Mpio., Santa Marta, near Bouda, ca. 1500 ft. [457 m], Aug., 1898–1899 (fl.), *H. Smith 432* (holotype, NY; isotypes, GH [2], K [2], MICH, MO, UC [2], US).

Stylogyne guatemalensis S. F. Blake, Contr. U.S. Natl. Herb. 24(1): 16. 1922. TYPE: Guatemala. Izabal: Quebradas, 19–22 May 1919 (fl.), *H. Pittier 8624* (holotype, US; isotype, NY).

Stylogyne perpunctata Lundell, Bull. Torrey Bot. Club 69(5): 398. 1942. TYPE: Belize. Stann Creek: Silk Grass Creek Reserve, 10 Sep. 1939 (fr.), *P. Gentle 2990* (holotype, MICH; isotypes, A, K, LL, NY).

Stylogyne turumiquirensis Steyerm., Fieldiana, Bot. 28(3): 479, fig. 109. 1953. TYPE: Venezuela. Sucre: Cerro Turumiquire, N-facing slopes above La Trinidad, SW of Cocollar, 2100–2200 m, 5 May 1945 (fl.), *J. Steyermark 62539* (holotype, F; isotype, NY).

Ardisia ibaguensis Lundell, Wrightia 3(8): 197. 1966. *Icacorea ibaguensis* (Lundell) Lundell, Phytologia 49(4): 349. 1981. TYPE: Colombia. Tolima: Ibagué, 700–800 m, 2 Mar. 1952 (fl., fr.), *M. Koie 5138* (holotype, C; isotype, LL [fragm.]).

Ardisia platyphylla Lundell, Wrightia 4(2): 62. 1968. *Icacorea platyphylla* (Lundell) Lundell, Phytologia 49(4): 350. 1981. TYPE: Venezuela. Monagas: Cerro Guácharo, above Guácharo Cave, near Guácharo, near summit, 1500–1620 m, 23 Apr. 1945 (fr.), *J. Steyermark 62324* (holotype, F, F images as F neg. 68327, LL neg. 1971-84; isotypes, NY, US, US image as LL neg. 1971-84, VEN, VEN image as LL neg. 1971-84).

Stylogyne oaxacana Lundell, Wrightia 4(2): 72. 1968. TYPE: Mexico. Oaxaca: Tuxtepec Distr., Chiltepec & vic., 22 m, 13 July 1940 (fl.), *G. Martínez C. 19* (holotype, LL; isotypes, A, MEXU, UC, US).

Mez (1902: 271) listed only one collection, *H. Eggers 14304*, from two herbaria (L, M) for his type of *Stylogyne balaensis*. A search of the L herbarium failed to reveal a specimen and it is presumed to be lost. Since the M sheet is present, it is designated as the lectotype. Some confusion has been caused by the fact that a sheet of a different collection, *Eggers 15071*, was labeled as "*Stylogyne balaensis* n. sp." in B but was destroyed in 1943 (Hiepko, 1987). This was photographed by Macbride (B image as F neg. 4837) and erroneously labeled as a type. Although widely distributed, this collection was clearly not mentioned in Mez's protologue.

35. Stylogyne viridis (Lundell) Ricketson & Pipoly, Sida 18(4): 1171, fig. 2. 1999. Basionym: *Parathesis viridis* Lundell, Phytologia 56(1): 26. 1984. TYPE: Venezuela. Amazonas: 0–1 km S of San Carlos de Río Negro, 01°51′N, 067°03′W, 120 m, 4 Feb. 1980 (fr.), *R. Liesner 9046* (holotype, MO; isotype, VEN not seen).

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Nomenclatural Notes on American Thymelaeaceae

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Abstract. The nomenclatural status of all published plant names applicable to American Thymelaeaceae at the rank of genus and below is evaluated. Thirty-two of the 256 published names at specific and infraspecific ranks require effective typifications. Lectotypes are designated for 29 names: *Daphne lagetto* Sw., *D. macrophylla* Kunth, *D. occidentalis* Sw., *D. pillopillo* Gay, *Daphnopsis bogotensis* Meisn., *D. brasiliensis* Mart., *D. caracasana* Meisn., *D. caribaea* Griseb. var. *ecuadorensis* Domke, *D. coriacea* Taub., *D. decidua* Domke, *D. ekmanii* Domke, *D. ericiflora* Gilg & Markgr., *D. longifolia* Taub., *D. longipedunculata* Gilg ex Domke, *D. longiracemosa* Gilg ex Domke, *D. martii* Meisn., *D. purpusii* Brandegee var. *ehrenbergii* Domke, *D. racemosa* Griseb., *D. sessiliflora* Griseb. ex Taub., *D. zamorensis* Domke, *Goodallia guianensis* Benth., *G. guianensis* var. *parvifolia* Benth., *Lagetta funifera* Mart. & Zucc. (epitype also designated), *Linostoma albifolium* Barb. Rodr., *Lophostoma bolleanum* Domke, *Schoenobiblus coriaceus* Domke, *S. daphnoides* Mart., *S. ellipticus* Pilg., and *S. peruvianus* Standl. Neotypes are designated for three names: *Daphnopsis crassifolia* (Poir.) Meisn. var. *eggersii* Krug & Urb., *D. pseudosalix* Domke, and *D. selerorum* Gilg.

Key words: Antilles Islands, Caribbean, Central America, *Daphnopsis*, *Dirca*, *Drapetes*, Falkland Islands, *Funifera*, *Goodallia*, *Lagetta*, *Lasiadenia*, *Linodendron*, *Lophostoma*, Neotropics, North America, *Ovidia*, *Schoenobiblus*, South America, *Tepuianthus*, the Americas, Thymelaeaceae.

Thymelaeaceae, now widely accepted as one of the basal families of Malvales, are composed of ca. 45 genera and 800 species that are mostly confined to Africa, Australia, and Asia (Herber, 2003). Two subfamilies are currently recognized for the family, the cosmopolitan Thymelaeaoideae (ca. 42 genera, 750 species) and the much smaller and mostly paleotropical Octolepidoideae (eight genera, ca. 50 species). In the Americas, the family is represented by 12 genera and ca. 115 species (or 14% of the family total) that are distributed from southeastern Canada through southern Chile and Argentina, and also in the Falkland Islands and the Caribbean. All American genera except *Tepuianthus* Maguire & Steyerm. belong to the much larger Thymelaeaoideae subfamily. Centers of species diversity are located in Brazil (particularly around Rio de Janeiro), northwestern South America (especially Ecuador, Colombia, and Venezuela), and the Greater Antilles. Despite the availability of relatively recent taxonomic treatments for some American genera, much of the nomenclature and typification of these groups has not been comprehensively evaluated, a shortcoming that is the primary focus of the research presented here.

Taxonomic History of American Thymelaeaceae

Daphnopsis Mart., with approximately 73 dioecious species, is by far the largest genus in the Americas, ranging from central Mexico to Chile and Argentina, and also throughout most of the Antilles. Nevling (1959) recognized 46 species in the last taxonomic revision of the genus and shortly afterward published a few corrections and updates, in which a few additional taxa were recognized (Nevling, 1960, 1963b). While most of Nevling's underlying taxonomy of *Daphnopsis* is reasonable, his treatment is difficult to use for identification purposes, because both staminate and pistillate flowers are required for the key (herbarium material is usually collected in fruit), and the species illustrations he provided only consisted of longitudinal floral dissections (about half of the species were only known to him from either staminate or pistillate specimens). Over the past 50 years, an additional 22 species from Central and South America and the Caribbean have been described (e.g., Cuatrecasas, 1962; Borhidi & Muñiz, 1976; Nevling & Barringer, 1986; Barringer & Pruski, 2005), which has further increased the need for a comprehensive taxonomic reevaluation of *Daphnopsis*.

The second largest American genus, *Schoenobiblus* Mart. (ca. 10 species), also dioecious, occurs predominately in lowland tropical South America, with a single species, *S. grandifolia* Urb., endemic to Trinidad and Tobago. *Schoenobiblus* has never been taxonomically revised. Most recent attention paid to the genus has been the description of a few taxonomic novelties (Barringer & Nevling, 1987; Steyermark, 1987) and the occasional treatment of one or two taxa in regional floras and catalogs published for Peru

(Macbride, 1941; Zarucchi, 1993), Trinidad and Tobago (Philcox, 1978), Ecuador (León-Yánez, 1999), French Guiana (Kawasaki & Mori, 2002), and Venezuela (Rogers et al., 2005).

Maguire and Steyermark (1981) described the enigmatic *Tepuianthus* (six species, Venezuela, adjacent Colombia, and Brazil; Steyermark, 1986–1987) in its own family and ascribed it to Sapindales (sensu Cronquist, 1968). Molecular data, well supported by morphology, suggest that *Tepuianthus* is sister to the basal subfamily Octolepidoideae within the Thymelaeaceae (Horn, 2004), and Wurdack and Horn (2001) recommended that the genus be placed in its own subfamily, a view that is shared by the author of the present paper. All seven of the published *Tepuianthus* names (six specific and one varietal; Berry & Rogers, 2005) do not pose nomenclatural or typification problems and are therefore not further discussed here.

Of the remaining 10 American genera in the family, none are composed of more than four species, and each genus has been taxonomically evaluated at least once since the 1960s. Nevling published comprehensive revisions for *Lophostoma* (Meisn.) Meisn. (four species, Amazonian Brazil and Amazonas, Venezuela; Nevling, 1963a), *Ovidia* Meisn. (three species, Bolivia, Chile, nearby Argentina; Nevling, 1964; Rogers et al., 2004), and *Funifera* Leandro ex C. A. Mey. (four species, Brazil; Nevling, 1965, 1976). Nesom and Mayfield (1995) described a third narrow endemic species in the North American genus *Dirca* L., based on material collected from northeastern Mexico, and more recently, Floden et al. (2009) described a fourth species endemic to Kansas, Arkansas, and probably Missouri. Two genera, *Linodendron* Griseb. (three Cuban species) and *Lagetta* Juss. (three species, Cuba, Jamaica, Haiti, Dominican Republic), were both treated by Noa Monzón (1992, 2009). Plowman and Nevling (1986) recognized two species of *Lasiadenia* Benth. (Venezuela, Colombia, Brazil), and an identification key for the genus was provided in Rogers et al. (2005). Heads (1990) recircumscribed *Drapetes* Banks ex Lam. to include a single species, *D. muscosus* Lam., from southern Chile, Argentina, and the Falkland Islands. The monotypic *Goodallia* Benth. is distributed in the lowlands of Guyana and Roraima, Brazil, and remains poorly known (Rossi, 1997, unpublished; Berry et al., 2007).

Materials and Methods

A list of American plant names of Thymelaeaceae was compiled based on thorough searches of pertinent botanical literature, herbarium specimen annotations, and online databases of plant nomenclatural data. Relevant specimens and literature at BM, F, G, K, MO, NY, P, and US were personally inventoried, photographed, scanned, and databased. Additional types and original material were examined and cataloged from several sources including online digital image repositories and databases, type photograph collections, and specimen images available on microfiche. Specimens were consulted from 33 herbaria: A, B, BM, BREM, C, CAS, CORD, E, F, G, GH, GOET, HBG, K, L, LE, M, MEL, MO, NY, P, PI, R, RB, S, SP, SPF, TRIN, U, UC, US, W, and Z. Curator R. Vogt (Botanischer Garten und Botanisches Museum Berlin-Dahlem) searched for extant original material of every name typified in this paper that was based on material deposited in the B herbarium, but found that the types for all names were destroyed during the Second World War.

Typification methodology followed Turland and Jarvis (1997), McNeill et al. (2006), and Rogers and Spencer (2006). When selecting types, the most complete herbarium specimens were chosen over illustrations whenever possible. Handwritten inscriptions on herbarium material were compared to handwriting examples taken from several sources including Steinberg (1977), ABG (2010), the Swedish Museum of Natural History (2010), and the personal correspondence of authors.

Results and Discussion

A total of 256 names belonging to American Thymelaeaceae at the rank of genus and below were identified: 23 generic, 207 specific, and 26 infraspecific (11 subspecies and 15 varieties). In all, 215 names (84%) were validly published, 17 were invalid, and 24 were valid but illegitimate (for details see Tropicos, 2010).

Names published at the generic rank

Of the 23 generic names, 19 are valid and are already effectively typified, while the other four are invalid orthographic variants (for details see Tropicos, 2010). Three names are illegitimate: *Dofia* Adans. (Adanson, 1763) [≡ *Dirca*], *Nordmannia* Fisch. & C. A. Mey. (Meyer, 1843) [= *Daphnopsis*] non Ledeb. ex Nordm. (Nordmann, 1837), and *Goodallia* Benth. (Bentham, 1845) non T. E. Bowdich (Bowdich, 1825). Names published at the rank of genus were typified by reference to a single species name in their original publications (Art. 37.3, McNeill et al., 2006), with two exceptions. Typifications were published retroactively by Lamarck (1792: 373) when he described *Lagetta lintearia* Lam. as the first constituent species of *Lagetta* (Jussieu, 1789), and by

Nevling (1959: 271) when he designated *Gastrilia umbellata* Raf. (Rafinesque, 1838), nom. illeg. (*Daphne occidentalis* Sw., typified here) [= *Daphnopsis occidentalis* (Sw.) Krug & Urb.] as the type for *Gastrilia* Raf.

The genus *Bosca* Vell. (Vellozo, 1825) was validly published with a single species (*Bosca stupacea* Vell.), but the whereabouts of the source specimens are unknown (Stafleu & Cowan, 1986) and the brief protologue description and associated illustration (Vellozo, 1827) lack sufficient detail for definite ascription to Thymelaeaceae. Meisner (1857) treated *Bosca* as a synonym of *Daphnopsis*, and Nevling (1959) further suggested that *B. stupacea* represented a species within his own *Daphnopsis* subg. *Neivira* (Griseb.) Nevling.

NAMES PUBLISHED AT SPECIFIC AND INFRASPECIFIC RANKS

Of the 233 names published at the rank of species and below, 172 were published for new taxa, 50 were recombinations, and 11 names were avowed substitutes. Nineteen names are illegitimate, while 15 names, including three orthographic variants, are invalid (for details see Tropicos, 2010).

TYPIFICATION OF SPECIFIC AND INFRASPECIFIC NAMES

About 80 of the 138 legitimate names published as new taxa were effectively typified within their original publications (counts exclude recombinations and avowed substitutes). Twenty-seven additional names were effectively typified by subsequent authors, although the lectotypification of *Linostoma calophylloides* Meisn. [≡ *Lophostoma calophylloides* (Meisn.) Meisn.] by Nevling (1963a: 157–158) is supersedable according to Article 9.17 (McNeill et al., 2006) because the holotype, *Spruce 967* (M 0145930), is still extant in the Munich herbarium.

Thirty-two names (28 specific and four varietal) are typified in the following list. Complete synonymy for the American taxa is not provided here, but nomenclatural and taxonomic synonyms for all names are available on the searchable Tropicos database (Tropicos, 2010).

Daphnopsis

Daphnopsis americana (Mill.) J. R. Johnst., Proc. Boston Soc. Nat. Hist. 34(7): 242. [25 June] 1909 [also Contr. Gray Herb. 37: 242. (25 June) 1909]. Basionym: *Laurus americana* Mill., Gard. Dict. (ed. 8): *Laurus* no. 10. [16 Apr.] 1768. TYPE: Mexico. Veracruz, 1730, *W. Houstoun s.n.* (holotype, BM 000645493).

Daphnopsis americana subsp. **ecuadorensis** (Domke) Nevling, Ann. Missouri Bot. Gard. 46: 315. 1959 [28 Jan. 1960], as "*ecuadoriensis*." Basionym: *Daphnopsis caribaea* Griseb. var. *ecuadorensis* Domke, Notizbl. Bot. Gart. Berlin-Dahlem 12: 727. [6 Dec.] 1935. TYPE: Ecuador. Balao, 27 Feb. 1892, *H. F. A. von Eggers 14316* (lectotype, designated here, Z 000027994; possible isotypes, A 00061503, LE, M 0145984, US 00117223).

Domke's holotype of *Eggers 14316* at B was destroyed. Sheet Z 000027994 is designated as the lectotype of *Daphnopsis caribaea* var. *ecuadorensis*, because it includes a typewritten *Ex Museo botanico Berolinensi* label and the month of February as mentioned in the protologue (Domke, 1935: 727). The duplicates of *Eggers 14316* at A, LE, M, and US are cited as possible isotypes since March is written on the labels. None of the examined material was annotated by Domke. In the last revision of the genus, Nevling (1959) formally recognized *D. americana* subsp. *ecuadorensis* and five other subspecies besides the autonym. León-Yánez (1999) reduced the Ecuadorian subspecies to synonymy with the species, although Nevling reported that the Ecuadorian material showed distinct morphological differences related to pedicel length and pistillode pubescence, and that those differences were correlated with an allopatric geographic distribution. The subspecies is tentatively retained here, but a comprehensive reevaluation of *D. americana* is needed to ascertain the taxonomic limits of the species and Nevling's subspecific taxa.

Daphnopsis brasiliensis Mart., Nov. Gen. Sp. Pl. 1: 65. [1 Oct.] 1824. TYPE: Brazil. São Paulo: "in Morro do Lobo prov. S. Pauli," s.d., *C. F. P. von Martius s.n.* (lectotype, designated here, M 0145988).

Daphnopsis and its type, *D. brasiliensis*, were validly published simultaneously via a single description (descriptio generico-specifica) in accordance with Article 42.1 (McNeill et al., 2006). In the protologue (Martius & Zuccarini, 1824b: 65), Martius used specimens taken from multiple plants to briefly describe staminate and pistillate flowers and fruits, and he cited the provenance of the original material as "Habitat in umbrosis sylvaticis ad Morro do Lobo atque inter Villam de S. João de Atibaya atque Jacaray, Provinciae S. Pauli versus confinia Provinciae Minas Geraës." There are four sheets at M (0145986–0145989) that correspond to the collections cited in the protologue. Among these syntypes, sheet

M 0145988 is designated as the lectotype of *D. brasiliensis* because it bears handwritten inscriptions by Martius of the species name and one of the place names (Morro do Lobo) specifically mentioned in the original publication. The specimen label on sheet M 0145987 notes the same locality as the lectotype, but the specimens affixed to the sheet were probably collected from a different plant. Contendas, a locality not explicitly mentioned in the protologue, is noted on the labels of the syntypes, M 0145986 and M 0145989.

Daphnopsis caracasana Meisn., Prodr. 14(2): 521–522. [Nov.] 1857. TYPE: Colombia. 1846, *H. Karsten 211* (lectotype, designated here, G-DC 00130580; isotypes, G 00190835, G 00190836, NY 00386261 fragm., P 00713261).

Daphnopsis bogotensis Meisn., Prodr. 14(2): 521. [Nov.] 1857. TYPE: Colombia. [Betw. Bogotá & Zipaquira], Prov. Quito Perou, 1843, *K. Hartweg 1366* (lectotype, designated here, G 00190832; possible isotypes, BM, G 00190833, G 00190834, K 000567838, K 000567839, LE [specimen at right], NY 00386260 fragm., P 00713256, P 00713288, P 00713289, W not seen).

Regarding *Daphnopsis caracasana*, Meisner (1857: 521–522) mentioned at least two different sources of original material in the protologue as "In Colombiâ (Karsten n. 211!). Daphne Caracasana Klotzsch! mss. in herb. DC., ect. ... (v.s. in herb. DC. et Shuttl.)." The cited Shuttleworth syntype material was not found at BM despite a thorough search of their entire Thymelaeaceae collection. Sheet G-DC 00130580 of the *Karsten 211* collection is designated as the lectotype of *D. caracasana* because the collection number and depository is clearly referenced in the protologue. Neither the sheet in G-DC nor the two sheets in the general G herbarium bear Meisner's handwritten annotation of the species name.

In the protologue of *Daphnopsis bogotensis*, Meisner (1857: 521) provided the provenance statement "In Colombiâ, inter urbem Bogota et Zipaquira (Hartweg, n. 1366!), et? prope Santa-Marta (Purdie, cfr. D. Purdiei). Thymelaea Benth.! pl. Hartweg. p. 247 ... (v. s. in herb. Boiss.)," indicating that at least two, and possibly even three, sources of original material were used for the description. No material of the species attributable to Purdie was found, and it is plausible that Meisner's mention of that collection was based on the description and locality statements published in the earlier *Plantas Hartwegianus* (Bentham, 1846: 247). Several duplicates of *Hartweg 1366* were examined from BM, G, K, LE, NY, and P. One of the three sheets seen at G (00190832) was annotated with the species name by Meisner, and it alone is designated as the lectotype of *D. bogotensis*. The other examined sheets are all regarded as possible duplicates of the lectotype.

Daphnopsis coriacea Taub., Bot. Jahrb. Syst. 12 (Beibl. 27): 7. [24 June] 1890. TYPE: Brazil. Rio de Janeiro, sommet da Tinguá, 6 June 1877, *A. F. M. Glaziou 8911* (lectotype, designated here, P 00713293; isotypes, C, F fragm. not seen, G 00190831 [2], K 000567848, K 000567849, NY, P 00713292, RB 183448).

Taubert (1890) mentioned two syntypes without a specific Brazilian locality and date in the protologue of *Daphnopsis coriacea* (*Glaziou 8911* and *14226*). Nevling (1959: 341, 343; 1968: 18) cited *Glaziou 8911* as the type collection, but his statements do not represent an effective lectotypification because he indicated four different depositories (C, F, NY, P) for the collection instead of selecting a single specimen in one herbarium, thereby conflicting with Article 8.1 (McNeill et al., 2006). Taubert's main herbarium at B was lost (Stafleu & Cowan, 1986). Examined duplicates of *Glaziou 8911* more closely match the protologue description compared to those of *Glaziou 14226*, especially with respect to the rounded-obtuse apices of the leaf blades. Sheet P 00713293 of *Glaziou 8911* bears a typewritten P label with collection information in anonymous handwriting along with a second label including the collection locality and date in Glaziou's handwriting. This sheet is designated as the lectotype of *D. coriacea*. The second P sheet (00713292) and the other examined sheets are regarded as duplicates of the lectotype. None of the studied sheets were annotated by Taubert.

Daphnopsis crassifolia (Poir.) Meisn., Prodr. 14(2): 524. [Nov.] 1857. Basionym: *Daphne crassifolia* Poir., Encycl. Suppl. 3: 316. [24 Sep.] 1813. TYPE: [Haiti or Dominican Republic.] St. Domingue, s.d., *H. Nectoux s.n.* (holotype, FI not seen; isotype, P 00713315).

Daphnopsis crassifolia (Poir.) Meisn. var. *eggersii* Krug & Urb., Bot. Jahrb. Syst. 15: 350. [10 Jan.] 1892. TYPE: Dominican Republic. Pedernales, Sierra de Bahoruco, secc. Los Arroyos, 1500 m, 10 July 2007, *T. Clase, L. Raz, D. Castillo, L. Reinoso & E. Soto 4545* (neotype, designated here, MO 6061840; isotype, NY 1163671).

Urban (1892: 350) cited the original material in the protologue of *Daphnopsis crassifolia* var. *eggersii* as "Habitat in Sto. Domingo in sylvis infra Valle nuevo alt. 1900 m. m. Majo fructif.: Eggers n. 2317." The holotype at B was destroyed and no extant duplicates

of *Eggers 2317* have been found. *Clase et al. 4545* (MO 6061840), designated here as the neotype of the variety, matches the Latin description and was collected ca. 125 air-km west-southwest of the type locality of the destroyed *Eggers 2317* collection. *Daphnopsis crassifolia* var. *eggersii* was most recently treated as a synonym of *D. crassifolia* by Liogier (1982), following Nevling (1959). That synonymy is provisionally followed here, but there is a sizeable amount of variation in the studied material and further examination may suggest that the variety should be recognized as a distinct species.

Daphnopsis ekmanii Domke, Repert. Spec. Nov. Regni Veg. 32: 85. [1 Mar.] 1933. TYPE: Dominican Republic. Samaná: Laguna, Loma Zaramagua, ca. 250 m, 9 June 1930, *E. L. Ekman H15259* (lectotype, designated here, S 04-787; isotypes, G 00190942, K 000567860, NY 00084367, S 04-786, US 00117226).

Daphnopsis ekmanii was based on one sterile collection (*E. L. Ekman H15259*) and the B holotype was destroyed. Of the examined duplicates (G, K, NY, S, US), Domke personally annotated both S sheets and the K sheet as types on 24 November 1932. The S sheet with the most complete label data (S 04-787) is designated as lectotype. *Daphnopsis ekmanii* was treated as a species of undetermined status by Nevling (1959), but was later recognized as a distinct species by Liogier (1982). The species may still only be known from its type. Type material of *D. ekmanii* has leaves most similar to those found on the type of the Puerto Rican species, *D. helleriana* Urb., except for a more narrowly obovate leaf blade with an acute or even acuminate apex. The broader blades of *D. helleriana*, by contrast, have a more rounded or obtuse apex. *Daphnopsis ekmanii* is recognized here following Liogier (1982) pending further investigation with additional collections.

Daphnopsis fasciculata (Meisn.) Nevling, J. Arnold Arbor. 44(3): 404. [9 July] 1963. Basionym: *Funifera fasciculata* Meisn., Fl. Bras. 5(1): 68. [1 Jan.] 1855. TYPE: Brazil. "habitat in prov. Minas Geraës," *J. F. Widgren 1025* (holotype, MEL 2123977; isotype, NY fragm. 00017524).

Daphnopsis longifolia Taub., Bot. Jahrb. Syst. 12 (Beibl. 27): 9. [24 June] 1890. TYPE: Brazil. Rio de Janeiro, campos da Bocaina, du Sobrado, 8 Jan. 1876, *A. F. M. Glaziou 8252* (lectotype, designated here, C; possible isotypes, K 000567844, P 00713307, P 00713308, RB 44892, US 00117230).

Taubert (1890) mentioned two collections in the protologue of *Daphnopsis longifolia*, *Glaziou 8252*, with staminate flowers, and *Glaziou 12141*, with pistillate flowers. Nevling (1959: 344, 346) later cited *Glaziou 8252* as the type and listed duplicates at C, F, P, RB, and US. His statement cannot represent an effective typification, since a single specimen in one herbarium was not mentioned (Art. 8.1, McNeill et al., 2006). Taubert's main herbarium at B was lost (Stafleu & Cowan, 1986). The examined C sheet (no barcode/accession number) bears label information cited in the protologue and includes four leafless branches and about eight leaves taped down to the sheet. All of these specimens together are designated as the lectotype of *D. longifolia*. None of the examined sheets bear Taubert's handwriting.

Daphnopsis longipedunculata Gilg ex Domke, Notizbl. Bot. Gart. Berlin-Dahlem 12: 723–724. [6 Dec.] 1935. TYPE: [Venezuela. Bolívar: Valley of the Cuquenan.] Roraima, im Galeriewald, bei dem Dorfe, 1400 m, Dec. 1909, *E. Ule 8739* (lectotype, designated here, K 000035671 [♀ fls.]).

Domke (1935) cited two collections in the protologue of *Daphnopsis longipedunculata*, *Ule 8739*, from a pistillate individual (flowers and immature fruits), and *Schomburgk 1057*, from a staminate individual. The syntypes at B were destroyed, and no extant duplicates of *Schomburgk 1057* have been located. A duplicate of *Ule 8739* with an ample pistillate specimen that closely matches the original description was found at K (K 000035671). That sheet is designated here as lectotype. The label on the lectotype lacks the country of collection and annotations by Gilg and Domke, but Roraima is specifically mentioned. Although Domke (1935) attributed *Ule 8739* to Roraima, Brazil, in the protologue, Ule (1914: 47) had previously referred to *D. longipedunculata* in his description of the Roraima vegetation while discussing the Valley of the Cuquenan, which is located in present-day Bolívar, Venezuela. Only two other collections of the species have been examined; both were likewise collected from Bolívar (*Dezzeo & Hernandez 121*, *136*, MO).

Daphnopsis macrophylla (Kunth) Gilg, Nat. Pflanzenfam. 3(6a): 236. [10 July] 1894. Basionym: *Daphne macrophylla* Kunth, Nov. Gen. Sp. (quarto ed.) 2: 151. [8 Dec.] 1817. *Daphne laurifolia* Willd. ex Kunth, Syn. Pl. 1: 446. [9 Dec.] 1822, nom. inval., pro *Daphne macrophylla* Kunth. TYPE: [Ecuador.] "Crescit in radicibus montis ignivomi Tunguraguae inter Ganse et Rio Puela, alt. 1240 hex. (Regno Quitensi.) Floret Julio," *F. W. H. A. von Humboldt & A. J. A.*

Bonpland s.n. (lectotype, designated here, P [Hb. Humboldt & Bonpland, fr. sheet]; probable isotypes, P [Hb. Humboldt & Bonpland, fl. sheet], B-Willd. [3209], NY 00386250 fragm. [3209 & 7550], P 00713287 [3209]).

Daphne lancifolia Humb. [& Bonpl.] ex Wikstr., Diss. Daphne 53. [13 June] 1817. *Daphnopsis humboldtii* Meisn., Prodr. 14(2): 520. [Nov.] 1857, nom. illeg. TYPE: Peru. *F. W. H. A. von Humboldt* [*& A. J. A. Bonpland*] *3209* (holotype, B-W 07550 in B-Willd.; probable isotypes, P [Hb. Humboldt & Bonpland, fr. sheet], P [Hb. Humboldt & Bonpland, fl. sheet], NY 00386250 fragm. [also numbered 7550], P 00713287).

Daphne macrophylla Kunth and *D. lancifolia* Humb. [& Bonpl.] ex Wikstr., two validly published names, represent the same American species currently recognized as *Daphnopsis macrophylla* (Kunth) Gilg. In regard to which name has priority, the name and description of *Daphne lancifolia* originally appeared in Wikström's dissertation entitled *Dissertatio de Daphne* with a title page date of 13 June 1817 (Wikström, 1817a). According to Stafleu and Cowan (1988: 284), the dissertation was also published as a "commercial edition" with a slightly different title page (Wikström, 1817b) sometime during 1817. Three years later, the name and description were republished almost verbatim in a second updated edition of the dissertation (Wikström, 1820), with the only notable change between the editions being the addition of Bonpland as a secondary author and collector of the original material (the names and specimens were originally attributed solely to Humboldt). *Daphne lancifolia* was never adopted post-1820, presumably because the commercial edition of Wikström's *Dissertatio* was always regarded as the validating publication. Post-1820, *Daphne lancifolia* was treated first as a synonym of *Daphne macrophylla* (Kunth, 1822), before being replaced along with *Daphne macrophylla* by the illegitimate *Daphnopsis humboldtii* Meisn. (Meisner, 1857), and has most recently been reduced to synonymy with *Daphnopsis macrophylla* (Kunth) Gilg (e.g., Nevling, 1959; León-Yánez, 1999). Kunth's *Daphne macrophylla* was effectively published on 8 December 1817 according to Stafleu and Cowan (1979, TL-2 entry no. 3143), and if we accept the date on the title page of Wikström's original dissertation (Wikström, 1817a) as the date of effective publication for *Daphne lancifolia*, the name would have priority over Kunth's name by nearly six months. Given this possible scenario, a conservation proposal for *Daphne macrophylla* was considered, but in the end abandoned, because Kunth's basionym and Gilg's subsequent recombination are already well established in the literature and herbarium. Furthermore, resurrecting *Daphne lancifolia* would require a new combination in *Daphnopsis* for a species with a relatively narrow distribution in Andean Ecuador, not to mention that the actual orthography of the name itself is in question because the epithet was spelled "lancifolia" in Wikström's dissertation (1817a, b, 1820), but was written as "laurifolia" on the original material deposited in the Willdenow herbarium at B (*Humboldt 3209*, B-W 07550). The specimens on that sheet, which were collected by Humboldt and Bonpland, are together regarded as the holotype of *Daphne lancifolia*.

Regarding the typification of *Daphne macrophylla*, Kunth (1817) described flowering and fruiting material from Ecuador in the protologue and did not cite a specimen. There are two unnumbered sheets, one with flowers and the other with fruits, deposited in the Herbier Humboldt & Bonpland at P that correspond to the name. Kunth personally annotated the sheet with large leaves and fruits, and the leaves on that sheet more closely match the leaf description given in the protologue. All parts on that sheet are collectively designated as lectotype of *D. macrophylla*. The second sheet in the Herbier Humboldt & Bonpland with flowers and smaller leaves, and the other examined sheets in B-Willd., NY, and P are probably either duplicates of the lectotype or syntypes of *D. macrophylla*. At least some of the original material and examined duplicates of both *D. macrophylla* and *D. lancifolia* may have come from the same plant or from the same set of plants originally collected by Humboldt and Bonpland.

Daphnopsis martii Meisn. in Mart., Fl. Bras. 5(1): 66, pl. 28, f. 2. [1 Jan.] 1855. TYPE: Brazil. Rio de Janeiro, habitat in sylvis, Nov. 1817, *C. F. P. von Martius 119* (lectotype, designated here, M 0145993; isotype, M 0145994).

The protologue of *Daphnopsis martii* (Meisner, 1855: 66) included a detailed description of staminate material, a few floral illustrations, and the provenance statement "Sched. n. 119. Martii, monentis Anibam Aubl. conferendam esse. Habitat in silvis montis Corcovado, prov. Rio de Janeiro, flor. m. Aug. Sept.: M." There are three relevant sheets in the Munich herbarium (M 0145993–0145995), none of which bear the handwritten annotation of the species name by Meisner or Martius. Labels on sheets M 0145993 and M 0145994 are numbered 119 and dated Nov. 1817. Rio de Janeiro is mentioned on both sheets, but only sheet M 0145994 includes the more detailed Corcovado locality cited in the protologue. The reference to November on both labels is ambiguous as only the months of August and September were provided in the protologue. Sheet M 0145995 lacks a number and date, but includes attribution to Rio de

Janeiro and Corcovado. It is impossible to determine if Meisner used all three sheets in his description, and whether or not these specimens came from the same locality and gathering. Given this ambiguity, *Martius 119* (M 0145993) is designated as the lectotype of *D. martii* because it is in the best physical condition. Since sheet M 0145994 is numbered 119, it is regarded as a duplicate of the lectotype, whereas the unnumbered and undated sheet M 0145995 is instead treated as a syntype. No intact open flowers remain on the three M sheets, so the detailed floral illustrations provided in the protologue should be used in conjunction with the type specimens.

Laclette (1977: 11) failed to designate a holotype when publishing the name "Daphnopsis aemygdioi" and instead cited two syntypes (*Laclette 45* [R 12882] and *Laclette 46* [R 12883]), which invalidates the name according to Article 37.1 (McNeill et al., 2006). Laclette contrasted the invalid name with *Daphnopsis utilis* Warm., names that were both based on material collected around Rio de Janeiro, but Rossi (1997, unpublished) provided compelling morphological evidence that Laclette's "Daphnopsis aemygdioi" is synonymous with *D. martii*.

Daphnopsis occidentalis (Sw.) Krug & Urb., Bot. Jahrb. Syst. 15: 349. [10 Jan.] 1892. Basionym: *Daphne occidentalis* Sw., Prodr. (Swartz) 63. [20 June–29 July] 1788. TYPE: Jamaica, s.d., *Herb. O. Swartz s.n.* (lectotype, designated here, S S-R-1401; probable isotype, S S-R-1402).

Two sheets of original material for *Daphne occidentalis* were examined from S (S-R-1401 and S-R-1402). Comparing the two, sheet S-R-1401 (ex Herb. Swartz) includes the most complete, fertile specimens and is the only one annotated with the species name by Swartz. That sheet alone is designated as lectotype. Sheet S-R-1402 (ex Herb. Swartz, ex Herb. Osbeckii on verso) was not annotated by Swartz, but is probably a duplicate of the lectotype. Several other Swartz specimens belonging to the species were examined at BM, C, and G-DC. Some or all of these may be duplicates of the lectotype or syntype material.

Daphnopsis pseudosalix Domke, Notizbl. Bot. Gart. Berlin-Dahlem 12: 724–725. [6 Dec.] 1935. TYPE: Brazil. Santa Catarina, 1816–1821, *A. Saint-Hilaire 1749* (neotype, designated here, P 00713798; isotypes, P 00713799, P 00713800).

Domke (1935) cited a single staminate collection (*C. Pabst 546*) from Santa Catarina in the protologue of *Daphnopsis pseudosalix*. The type material at B was destroyed and no extant duplicates were found. *Saint-Hilaire 1749* (P 00713798) includes a Santa Catarina label and four staminate specimens that all match the protologue description. The entire sheet is designated as neotype. Two other sheets of *Saint-Hilaire 1749* were found at P (P 00713799, P 00713800), and the staminate specimens affixed to those sheets are regarded as duplicates of the lectotype. The illustrations of *D. pseudosalix* and the description of pistillate flowers provided in Nevling (1963b) should be disregarded, as that information was based on a misidentified collection (*E. Ule 504*, HBG). For illustrations of both staminate and pistillate flowering material and a complete description of the species, see Nevling and Raulino Reitz (1968).

Daphnopsis purpusii Brandegee, Univ. Calif. Publ. Bot. 4(3): 89. [26 May] 1910. TYPE: Mexico. Puebla: Cerro de Paxtle, Sep. 1909, *C. A. Purpus 4116* (holotype, UC 136842; isotypes, A not seen, BM, E 00313901, F 276623, G 00190932, MEXU not seen, MO 3942641, NY 00386257, US 00117239).

Daphnopsis purpusii Brandegee var. *ehrenbergii* Domke, Notizbl. Bot. Gart. Berlin-Dahlem 12: 728. [6 Dec.] 1935. TYPE: Mexico. Puebla: Tehuacan?, Sep. 1911, *C. A. Purpus 5707* (lectotype, designated here, F 299257; isotypes, A not seen, BM not seen, GH 00257836, MO 5467671, NY 1104559, US not seen).

Daphnopsis decidua Domke, Notizbl. Bot. Gart. Berlin-Dahlem 12: 726–727. [6 Dec.] 1935. TYPE: Mexico. Puebla: Tehuacan, [El Riego,] July 1906, *C. A. Purpus 4447* (lectotype, designated here, US 00117225; isotypes, A not seen, F 344055, GH 00061456, MO 5467672).

Domke (1935: 728) cited two Mexican collections in the protologue of *Daphnopsis purpusii* var. *ehrenbergii* as "bei Los Baños. Ein 2–3 m hohes Baümchen. (Mit Früchten im Dezember 1838—Ehrenberg n. 1012 [Typus!].—Bei Puebla im September 1911 steril—Purpus n. 5707.)." No holotype material of *Ehrenberg 1012* was found at B, but extant duplicates of the *Purpus 5707* paratype were examined at F, GH, MO, and NY. Sheet F 299257 of Domke's paratype still has one attached fruit and is designated as the lectotype of *D. purpusii* var. *ehrenbergii* in accordance with Article 9.10 (McNeill et al., 2006). The other examined duplicates of the lectotype are pistillate with loose fruits. There is a staminate flowering specimen labeled *Purpus 5707* in the Paris herbarium (P 00761269) that is probably not a duplicate of the original material, because flowers were not described in the protologue and the date of June 1912 written on the label disagrees with the protologue date of September 1911.

Domke mentioned that fruits of *Daphnopsis purpusii* var. *ehrenbergii* are larger than those of *D. purpusii* (7 mm vs. 4 mm in diameter, respectively), but his observation may have been based on incomplete fruiting material because the fruits of several examined isotypes of *D. purpusii* (*Purpus 4116*) measure 6–7 mm in diameter. Nevling (1959) noted that the species could be divided into two groups based on indument (pubescent in typical *D. purpusii* vs. glabrous in *D. purpusii* var. *ehrenbergii*). According to Nevling, the variation did not warrant recognition of two separate taxa because the flowers were so similar, and his view is tentatively followed here.

In the protologue of *Daphnopsis decidua*, Domke (1935) cited two different Mexican collections from El Riego (Tehuacán, Puebla), noting *Purpus 4447'* from June 1912 as the type, and *Purpus 4447* from July 1906 as the isotype. The original material of both collections at B was destroyed. Four extant duplicates of *Purpus 4447* were examined (F, GH, MO, US), and each one bears the original determination ("*Daphnopsis salicifolia* Meisner, form?") in anonymous handwriting that was explicitly mentioned in Domke's protologue. Puebla and Tehuacan are noted on the labels, but the more specific locality of "El Riego" is not included. The specimen on the US sheet is in the best physical condition of the examined duplicates and is designated as the lectotype of *D. decidua*.

Daphnopsis racemosa Griseb., Symb. Fl. Argent. 134. [Mar.–Apr.] 1879 [also Abh. Königl. Ges. Wiss. Göttingen 24: 134. 1879]. TYPE: Argentina. Concepción del Uruguay, Ufergebüsch am Puerto de las Piedras, 12 Oct. 1875 (♀ fls., imm. fr.), *P. Lorentz 205* (lectotype, designated here, GOET 003307; isotype, CORD [as *Lorentz 205*β]).

Daphnopsis longiracemosa Gilg ex Domke, Notizbl. Bot. Gart. Berlin-Dahlem 12: 728–729. [6 Dec.] 1935. TYPE: Brazil. Ceará: Pico Alto, Serra de Baturité, Sep. 1910 (♀ fls.), *E. Ule 9077* (lectotype, designated here, K 000567853).

In the protologue of *Daphnopsis racemosa*, Grisebach (1879: 134) cited the provenance "E. [Entre Ríos]: in fruticetis ripariis pr. Concepcion de Uruguay," and described staminate and pistillate flowers and fruits, indicating that he used at least two different collections in the description. Hunziker (1960: 352) discussed three different Lorentz collections at CORD as "Isocótypos?" of *D. racemosa*, none of which bears annotations by Grisebach: *Lorentz 205*[α] (30 Oct. 1875, fruits), *205*[β] (12 Oct. 1875, pistillate flowers and immature fruits), and *1159* (Oct. 1877, staminate flowers). Hunziker added his own alpha and beta designations after *Lorentz 205* on the herbarium labels to indicate that the specimens came from different localities and gathering events. Two years later, Hunziker traveled to Universität Göttingen, the home institution of Grisebach and Lorentz, to study the original Lorentz collections and to update his 1960 publication with GOET material (Hunziker, unpublished; G. Barboza, pers. comm.). In his updated manuscript, which was never published, he noted on 19 March 1962 that duplicate material of *Lorentz 205*[α] and *205*[β] (CORD) was at GOET. Both of those sheets (GOET 003307, 003308) were annotated by Grisebach and lack Hunziker's alpha and beta designations. Sheet GOET 003307 was dated 12 Oct. 1875 and bears pistillate flowers and immature fruits, whereas sheet GOET 003308 was dated 30 Oct. 1875 and bears either mature or nearly mature fruits. A slightly more complete specimen is affixed to *Lorentz 205* (GOET 003307), so the entire sheet is designated as the lectotype of *D. racemosa*. Sheet G 003308, dated a few weeks later than the lectotype collection, is a syntype. The CORD sheet that was annotated by Hunziker as *Lorentz 205*β is regarded as a duplicate of the lectotype. Besides the sheet of *Lorentz 1159* at CORD that could be syntype material, several other Lorentz collections belonging to *D. racemosa* have been examined at G, GH, K, M, MO, and US. These sheets are variously numbered and dated, with some totally lacking collection number and date information. It is impossible to identify which of these examined specimens could be duplicates of the original material, because none of them were annotated by Grisebach.

In the protologue of *Daphnopsis longiracemosa*, Domke (1935) described staminate and pistillate flowers, indicating that he used material from at least two different plants mixed under the same collection number (*Ule 9077*). The original material at B was destroyed. One duplicate at K (K 000567853) includes ample pistillate material and the entire sheet is designated as the lectotype of *D. longiracemosa*. Four sheets of *Ule 9077* with staminate specimens were also examined (G 00190931 [2], U 0006865, US 00117231), and all of these are regarded as syntypes since they did not come from the same plant as the K lectotype. None of the examined specimens were annotated by Domke or Gilg, despite Domke's notation of "Gilg in sched." after the name in the protologue (Domke, 1935: 728).

Daphnopsis selerorum Gilg, Verh. Bot. Vereins Prov. Brandenburg 58: 153. [1 May] 1917. TYPE: Guatemala. Huehuetenango: betw. Xoxlac & Nucapuxlac, Sierra de los Cuchumatanes,

1650–2500 m, 17 July 1942 (♀ fls.), *J. Steyermark 48933* (neotype, designated here, F 1131780).

Gilg (1917: 153), in the protologue of *Daphnopsis selerorum*, described pistillate material and cited the provenance of the original collection as "Habitat in Guatemala, in dept. Huehuetenango: in distr. Nenton, prope Yalambohoch, in silva primaeva humida: Seler n. 2866—Flor.: Aug." No extant duplicates of *Seler 2866* have been found. Compared to Gilg's description, the pistillate neotype (*Steyermark 48933*, F 1131780) designated here has slightly larger leaves and longer pedicels, and was collected about 25 air-km east of Seler's type locality. Nevling (1959) recognized *D. selerorum* as distinct from *D. radiata* Donn. Sm., and synonymized another Guatemalan species, *D. malacophylla* Standl. & Steyerm., with *D. selerorum*. Standley and Williams (1962) instead considered *D. selerorum* to be a synonym of the earlier *D. radiata*, and resurrected *D. malacophylla* from Nevling's (1959) synonymy and treated it as a distinct species. Standley and Williams (1962: 238, fig. 38) also used *Steyermark 48933* for their illustration of *D. radiata*. Regarding *D. radiata*, the protologue description (Donnell Smith, 1889) and holotype (*von Tuerckheim 1163*, US) for the name differs notably from Gilg's original description of *D. selerorum* and its neotype by having inflorescences borne on much longer peduncles (4.5–5 cm vs. 1.7–2 cm long) with fewer flowers per pistillate inflorescence (25 to 38 vs. ca. 60), and flowers with longer pedicels (ca. 10 mm vs. 7–8 mm long). Given these differences, both *D. malacophylla* and *D. selerorum* are tentatively maintained as species distinct from *D. radiata*.

Daphnopsis utilis Warm., Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1871: 318–320. 1871. TYPE: Brazil. "in vic. Rio de Janeiro, Lagoa Santa, in silvis et virgultis haud rara," s.d., *A. F. M. Glaziou 2963* (lectotype, designated by Nevling, 1959: 335, C 10001736; isotype, C 10001735).

Daphnopsis sessiliflora Griseb. ex Taub., Bot. Jahrb. Syst. 12 (Beibl. 27): 8–9. [24 June] 1890. TYPE: Brazil. [Rio de Janeiro, Serra dos Órgãos, 28 Feb. 1889], *A. F. M. Glaziou 17747* (lectotype, designated here, G 00190927; possible isotypes, BM 000092158, C, F not seen, G [specimen stored in same folder jacket as G 00190927], K 000567859, LE, NY 00017525, P, RB 44890, US 00117243).

Taubert (1890) cited a single staminate collection (*Glaziou 17747*) from an unspecified Brazilian locality in the protologue of *Daphnopsis sessiliflora*. Taubert's main herbarium at B was lost during World War II (Stafleu & Cowan, 1986), and none of the examined extant duplicates (BM, C, G, K, LE, NY, P, RB, US) bear his handwriting. Both specimens attached to sheet G 00190927 are staminate and are together designated as the lectotype of *D. sessiliflora* because they are in good physical condition, and the label on the sheet includes the locality mentioned by Glaziou in a publication about his own Brazilian collecting localities (Glaziou, 1913). Within the same folder jacket containing G 00190927, there is another staminate specimen of *Glaziou 17747* (no barcode/accession number) attached to a different sheet, and that specimen is regarded as a possible duplicate of the lectotype.

Daphnopsis zamorensis Domke, Notizbl. Bot. Gart. Berlin-Dahlem 12: 729. [6 Dec.] 1935. Ecuador. Around Zamora and Loja, E Andes, 1000–1500 m, Nov. [no year], *F. C. Lehmann 4823* (lectotype, designated here, K 000567830).

The holotype of *Daphnopsis zamorensis* deposited at B was destroyed. Nevling (1959), unable to locate extant duplicates, treated the species as one of uncertain status, but Nevling and Barringer (1988) and León-Yánez (1999) have since formally recognized the species. One extant duplicate of *Lehmann 4823* has been found at K (K 000567830). The sheet, which was not annotated by Domke, includes two leaves and four pistillate flowering inflorescences that closely match the protologue description. All parts belonging to the sheet are collectively designated as lectotype.

Examination of the type material confirms that *Daphnopsis zamorensis* is a distinctive species, easily recognized by its ca. 8 cm long pistillate racemose inflorescences and its relatively large obovate leaves reaching 27 × 8 cm in size. Nevling and Barringer (1988) erroneously reported 1–2 mm long petioles for the species in a key to Ecuadorian species; the petioles on the K lectotype are 1–1.5 cm long and were described as such in Domke's original 1935 description.

FUNIFERA

Funifera brasiliensis (Raddi) Mansf., Kulturpflanze, Beih. 2: 299. 1959. Basionym: *Daphne brasiliensis* Raddi, Mem. Mat. Fis. Soc. Ital. Sci. Modena, Pt. Mem. Fis. 18(2): 391. 1820. TYPE: Brazil. [Rio de Janeiro:] "Trovasi nei Boschi in vic. de Rio-Janeiro, e seg. Presso Matacavallos," s.d., *G. Raddi s.n.* (lectotype, designated as "type" by Nevling [1965: 235], PI).

Lagetta funifera Mart. & Zucc., Flora 7(1) (Beibl. 4): 136. [25 Apr.–30 June] 1824. TYPE: Brazil. Iter Brasil, habitat in sepibus ad Rio de Jo., s.d., *C. F. P. von Martius s.n.* (lectotype, designated here, M 0146002). EPITYPE: "Tab. 39, Lagetta Funifera," pl. 39 in Martius & Zuccarini, Nov. Gen. Sp. Pl., Vol. 1. 1824 (epitype, designated here, pl. 39, Martius & Zuccarini, 1824b).

The protologue of *Lagetta funifera* consisted of a reference to a plate, numbered 39, followed by a brief, but diagnostic description based on staminate and pistillate material (Martius & Zuccarini, 1824a: 136). Plate 39, an illustration of the species in partial color, was actually published several months later on 1 October 1824 in the companion publication *Nova Genera et Species Plantarum* (Martius & Zuccarini, 1824b: 65), and in that work, the species received a greatly amplified description followed by the provenance statement, "Habitat locis montanis ad Aqua-eductum prope Rio de Janeiro. Floret Julio." Six sheets deposited in the Munich herbarium belong to *L. funifera*. Five of those sheets (M 0146001–0146005) were collected by Martius and probably represent original material. Moreover, sheet M 0146002 with an ample staminate specimen and sheet M 0146005 with two pistillate specimens are clearly syntypes as they were both annotated with the species name by Martius. Either sheet would be an equally suitable choice for lectotype and the two were probably source material (i.e., typotypes) for plate 39 (Martius & Zuccarini, 1824b). The large staminate specimen affixed to M 0146002 is designated as lectotype. Few intact flowers remain on the lectotype, so plate 39, which includes diagnostic features such as habit, staminate and pistillate flowers, fruits, and seeds, is designated here as the epitype to support the lectotype (Art. 9.7, McNeill et al., 2006). The valid name, *Daphne brasiliensis* Raddi (1820), appeared as a synonym below *Lagetta funifera* in the amplified description and plate (Martius & Zuccarini, 1824b). Raddi's name, however, was not mentioned in the original protologue (Martius & Zuccarini, 1824a), otherwise Martius' name would have been invalidated.

Funifera ericiflora (Gilg & Markgr.) Domke, Biblioth. Bot. 27(111): 57. 1934. Basionym: *Daphnopsis ericiflora* Gilg & Markgr., Repert. Spec. Nov. Regni Veg. 19: 113. [30 June] 1923. TYPE: Brazil. Matto Grosso: Rio Sacre, June 1909, *F. C. Hoehne (Commissão Rondon) 2112* (lectotype, designated here, R 27302).

Gilg and Markgraf used a single staminate Hoehne collection numbered 2112 in the protologue description of *Daphnopsis ericiflora* (Markgraf, 1923). The holotype deposited at B, Gilg and Markgraf's home institution, was destroyed. An extant duplicate of *Hoehne 2112* deposited at R (R 27302) bears an undated typewritten determination of the name by Markgraf. The sole staminate specimen affixed to that sheet is designated as the lectotype. Hoehne (1951) stated that the locality of his number 2112 was Rio Xacuruiná [Sacuruiná or Sucuruiná?] on the side of Ponte de Pedra, but his assertion was probably a mistake since Rio Sacre is clearly noted in the protologue and on the label of the lectotype. Besides the lectotype, *Funifera ericiflora* may still only be known from two other collections: *Hoehne 5504* (R) from Juruena, Mato Grosso (Nevling, 1965), and *Pires et al. 6274* (NY) from Serra do Cachimbo, Pará (Rossi, 1997, unpublished).

GOODALLIA

Goodallia guianensis Benth., London J. Bot. 4: 633–634. [Dec.] 1845. TYPE: [Guyana]. British Guiana, near the brook Curassawaka, 1836, *R. Schomburgk 142 p.p.* (lectotype, designated here, K 000567821 [specimen in lower half]; isotypes, BM [2], G 00190984, G 00190985, G 00190986, G 00190987, G-DC 00130556, K [3], NY 00017523, U 0006867, U 0006868).

Goodallia guianensis Benth. var. *parvifolia* Benth., London J. Bot. 4: 634. [Dec.] 1845, as "var.? parvifolia," syn. nov. TYPE: [Guyana]. British Guiana, near the brook Curassawaka, 1836, *R. Schomburgk 142 p.p.* (lectotype, designated here, K 000567821 [specimen in upper half]).

In the protologue of *Goodallia* Benth., non *Goodallia* T. E. Bowdich, Bentham (1845: 633–634) published three separate descriptions for the genus, the species *G. guianensis*, and a single variety *G. guianensis* var. *parvifolia*. For the species, Bentham cited the provenance of the original material as "[o]n the brook Curassawaka, a tributary of the Rupunoony, Schomburgk, 1st Coll. n. 142, in part," whereas for the variety he noted "[s]ent by Schomburgk with the last under the same number [142], and possibly gathered from the same bush, but the foliage and branches are so very different as to leave it doubtful whether they do not belong even to a distinct species." Regarding typification, four sheets labeled *Schomburgk 142* were found at K, but only one sheet (K 000567821), with two attached specimens, was annotated with the species name by Bentham. The specimen in the lower half of the sheet corresponds to the protologue description of *G. guianensis*, and this specimen alone is designated as the lectotype of the species name. The specimen attached to the upper half of that same sheet (K 000567821) is the only original material of *G. guianensis* var. *parvifolia* and is designated as the

lectotype of the varietal name. None of the material seen at K was annotated with the varietal name. Bentham's reported differences of the small-leaved variety were clearly artificial because the specimen he used for the varietal description was collected from a branch growing near the tip of a stem where leaves are usually smaller, narrower, and apiculate at their apices. Alternatively, leaves collected from older branches are generally larger and broader with rounded-obtuse apices as seen on the type material of *G. guianensis*. Long intact branches showing a continuous range of leaf variation for the species are mounted on *Ducke 1310* (F, NY, US), *Mutchnick 709* (NY), and *Ule 7868* (K).

Lagetta

Lagetta lagetto (Sw.) Nash, J. New York Bot. Gard. 9: 117. [June] 1908. Basionym: *Daphne lagetto* Sw., Prodr. (Swartz) 63. [20 June–29 July] 1788. TYPE: Jamaica. "Ind. occid. Jam.," s.d., *Herb. O. Swartz s.n.* (lectotype, designated here, S S-R-1400).

In the protologue of *Daphne lagetto*, Swartz (1788: 63) explicitly cited at least three sources of original material by referencing three pre-Linnaean names via the statement, "Lagetto. 10–11. D. spicis paniculatis terminalibus, foliis ovatis acutis. Brown. jam. 371. t. 31. f. 5. Laurifolia arbor. Sloan h. 2. 22. t. 168. 1. 2. 3. 169. I. Bois dentelle. Nicols. Doming. 172. t. 1. f. 1, 2, 3, 4, 5. Jamaica, Hispaniola." The descriptions and accompanying illustrations in all three pre-Linnaean publications probably represent *D. lagetto* and match the morphology of the sole herbarium sheet annotated with that name in Swartz's own herbarium (S-R-1400 at S). That sheet, designated here as lectotype, is fertile and in good condition, and was annotated with the species name by Swartz himself. Nordenstam et al. (1994) noted that Swartz types might also be deposited at BM and SBT, but no original material has been identified at either of those institutions.

Lophostoma

Lophostoma ovatum Meisn., Prodr. 14(2): 600. [Nov.] 1857. TYPE: [Brazil. Amazonas: Manáos] "Circa Barra, prov. Rio Negro," May 1851, *R. Spruce 1461* (holotype, G-DC 00131539; isotypes, BM 000092160, E 00313897, G 00190894, K 000567925, K 000567926, K 000567927, LE not seen, NY fragm. 00017519, P 00713268, P 00713269, TCD 0007491).

Linostoma albifolium Barb. Rodr., Vellosia (ed. 2) 1: 67–68. 1891. TYPE: "Est. XX. *Linostoma albiflorum* [sphalm., *albifolium*] Barb. Rod.," pl. 20 in Barbosa Rodrigues, Vellosia (ed. 2), 3. 1891 (lectotype, designated here, pl. 20, Barbosa Rodrigues, 1891b).

Lophostoma bolleanum Domke, Notizbl. Bot. Gart. Berlin-Dahlem 11: 350–352. [30 Mar.] 1932. TYPE: Brazil. Civ. Amazonas, Manáos, "silva paludosa et periodice inundabili ad Igarapé do Crespo," 22 July 1929, *A. Ducke 23469* (lectotype, designated here, S 09-21081; isotypes, G 00190965, K 000567924, P 00713270, RB 23469, U 0006874, US 00117193).

In the protologue of *Linostoma albifolium*, Barbosa Rodrigues (1891a: 67–68) cited one collection numbered 63 in the Herb. Museu Botanico do Amazonas series, mentioned the provenance "Hab. in Rio Negro, circa Manaos. Floret m. Januario," and made reference to a related plate numbered 20. All but two Amazonian herbarium collections made by Brazilian botanist João Barbosa Rodrigues (1842–1909) were lost when the Museu Botanico do Amazonas closed in 1890 (Cribb & Toscano de Brito, 1996). No duplicates of original material of *L. albifolium* have been found despite sending inquiries to several Brazilian herbaria (R, RB, SP, SPF). Plate 20, illustrated by Barbosa Rodrigues and published the same year as the description, represents the only extant original material for the name (Barbosa Rodrigues, 1891b). The plate includes detailed diagnostic illustrations of flowers and fruits and is designated as the lectotype of *L. albifolium* following Articles 9.2 and 9.10 (McNeill et al., 2006). The epithet of the species was spelled *albifolium* for the description and in the text index (Barbosa Rodrigues, 1891a), but appeared as *albiflorum* in the caption of plate 20 and in the index for plates (Barbosa Rodrigues, 1891b). There is little doubt that Barbosa Rodrigues intended for the orthography of the epithet to be *albifolium*, because the terminal leaves in the description were described as white (i.e., glaucous), while the flower color was not specifically mentioned.

The B holotype for *Lophostoma bolleanum* was destroyed. Several duplicates of the type collection, *Ducke 23469*, were examined from G, K, P, RB, S, U, and US, but none of those were annotated by Domke. The sole specimen affixed to sheet S 09-21081 is designated as the lectotype of *L. bolleanum* as it is in the best physical condition.

Ovidia

Ovidia pillopillo (Gay) Meisn., Prodr. 14(2): 524. [Nov.] 1857. Basionym: *Daphne pillopillo* Gay, Fl. Chil. 5: 315–316. 1849 [published 1851 or 1852 fide Stafleu & Cowan, 1976]. TYPE: Chile. Valdivia, Feb. 1835, *C. Gay 188* (lectotype, designated here, NY 00386220).

Gay (1849) specifically mentioned the locality of Valdivia, Chile, without citing a collection in the protologue of *Daphne pillopillo*. According to Stafleu

and Cowan (1976), Gay's herbarium and types are deposited at P, but the original material for the name has not been found despite extensively searching the Thymelaeaceae collections at P on several occasions between 2003 and 2009. Presumably the holotype has been missing for a long time, since Nevling did not receive any type material on loan from P for his *Ovidia* treatment, and he instead only mentioned a duplicate of *Gay 188* at NY as an isotype (Nevling, 1964: 78, 80). The label on that NY sheet (00386220) mentions Valdivia and is stamped *Herb. Mus. Paris*. Three specimens, all matching the protologue description and attached to NY 00386220, are together designated as the lectotype since the P holotype is missing.

SCHOENOBIBLUS

Schoenobiblus coriaceus Domke, Notizbl. Bot. Gart. Berlin-Dahlem 11: 355–356, f. 8 (nos. 2–4). [30 Mar.] 1932. TYPE: Colombia. [Magdalena:] Santa Marta, Las Nubes, forest hillside, 4500 ft., 5 Dec. 1898–1901, *H. H. Smith 795* (lectotype, designated here, G 00191005; isotypes, A 00061578, BM, F 137800, G 00191004, GH 00072383, L 0010249, MO 1786785, NY 00386368, P 00713366, P 00713367, S 04-804, U 0006882, US 00117255).

The holotype of *Schoenobiblus coriaceus* at B was destroyed, but extant duplicates of *Smith 795* were examined from A, BM, F, G, GH, L, MO, NY, P, S, U, and US. Of these sheets, only G 00191004 and G 00191005 were annotated by Domke (det. "co-typus" with the species name and stamped 1935). The single specimen affixed to each G sheet closely matches the description and the associated floral illustrations published in the protologue. Sheet G 00191005 includes a slightly more complete specimen and is therefore designated as lectotype. *Schoenobiblus coriaceus* is provisionally recognized as a distinct species, but the genus, with its 11 published species names, is in need of taxonomic revision.

Schoenobiblus daphnoides Mart., Nov. Gen. Sp. Pl. 1(3): 65. 1824. TYPE: Brazil. "Brasilia Provinc. do Alto Amazonas, in sylvis inundatis ad fluv. Japurá," s.d., *C. F. P. von Martius s.n.* (lectotype, designated here, M 0146089).

Schoenobiblus and its type *S. daphnoides* were validly published simultaneously via a single description (descriptio generico-specifica) in accordance with Article 42.1 (McNeill et al., 2006). In the protologue (Martius & Zuccarini, 1824b: 65), Martius provided a brief Latin description for the genus including a few staminate floral characters, followed by the provenance "Habitat in sylvis inundatis ad flumen Japurá, Provinciae a flumine nigro dictae." There are three specimens in the Munich herbarium (M 0146087–0146089) matching the description and provenance mentioned in the protologue, but none bear inscriptions of the species name in Martius' handwriting. Sheet M 0146089, designated here as the lectotype of *S. daphnoides*, has the most intact open flowers of any sheet and was probably used later for the detailed illustration that accompanied the amplified description appearing in *Flora Brasiliensis* (Meisner, 1855). The two other sheets at M (M 0146087 and M 0146088) are regarded as syntypes.

Schoenobiblus ellipticus Pilg., Verh. Bot. Vereins Prov. Brandenburg 47(2): 162–163. [1 Oct.] 1905. TYPE: Brazil. Amazonas: Rio Juruá, Marary [Marari], Oct. 1900, *E. Ule 5253* (lectotype, designated here, G 00191003 [♂ fls.]; isotypes, K 000567876 [♂ fls., upper half of sheet], L 0043234 [♂ fls., upper half of sheet]).

In the protologue of the dioecious *Schoenobiblus ellipticus*, Pilger (1905: 162) used pistillate and staminate plants mixed under the same collection number (*Ule 5253*) for his description. The original material deposited at B was destroyed, but extant duplicates have been examined from G, K, and L. Two sheets of *Ule 5253* are at G. The first G sheet bears barcode information (G 00191003), a label with a detailed locality, and a staminate specimen, whereas the second G sheet, mounted within the same folder jacket as G 00191003, lacks a barcode and locality, and bears a pistillate specimen. The staminate specimen explicitly barcoded G 00191003 is designated here as the lectotype of *S. ellipticus*, while the staminate specimens affixed to the upper half of L 0043234 and K 000567876 are treated as duplicates of the lectotype. The sheet with the pistillate flowering specimen jacketed with G 00191003 and the pistillate material attached to the lower half of sheets L 0043234 and K 000567876 are all regarded as syntypes.

Schoenobiblus peruvianus Standl., Field Mus. Nat. Hist., Bot. Ser. 11(5): 169. [10 Feb.] 1936. TYPE: Peru. Dept. Loreto, Timbuchi on the Río Nanay, 1 July 1929 (♂ fls.), *L. Williams 1162* (lectotype, designated here, F 608105; isotype, G 00191002).

Standley (1936: 169) cited five Peruvian syntypes in the protologue of *Schoenobiblus peruvianus* as "Peru: Timbuchi, Alto Río Nanay, Dept. Loreto, July

1, 1929, *Llewelyn Williams 1162*. Paraíso, Alto Itaya, *Williams 3354*. Pebas, in forest, *Williams 1707, 1878, 1595*." The sheet of *Williams 1162* deposited at F (608105) is in staminate flower, bears Standley's own handwritten annotation as type, and is designated as the lectotype of *S. peruvianus*. The four other syntypes are fruiting. *Schoenobiblus peruvianus* has been recognized as a distinct species for Peru (Macbride, 1941; Zarucchi, 1993; Vásquez Martínez, 1997) and Ecuador (León-Yánez, 1999), and the species is provisionally accepted here pending further taxonomic investigation.

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Oncaglossum, a New Genus of the Boraginaceae, Tribe Cynoglosseae, from Mexico

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ABSTRACT. A new monotypic genus, *Oncaglossum* Sutorý, endemic to central Mexico, is described based on *Cynoglossum pringlei* Greenm. from the state of Mexico and belongs within the tribe Cynoglosseae of the Boraginaceae. The new genus is related to *Cynoglossum* L. subg. *Eleutherostylum* (Brand) Riedl and can be distinguished from the North American species currently classified in *Cynoglossum* by its calyx with imbricate, colored, and broadly ovate sepals, the corolla lobes reduced to narrow strips, anthers on short filaments inserted on the corolla margin, the stigma in the form of a lenticular disc, and tricolporate pollen grains with an additional aperture in their polar region.

Key words: Boraginaceae, Cynoglosseae, *Cynoglossum* subg. *Eleutherostylum*, Mexico.

The generic concept in *Cynoglossum* L. (Boraginaceae, Cynoglosseae) has been discussed for a long time, and various concepts have been used. The moderately conservative concept by Brand (1921) was followed by Riedl (1962) and Al-Shehbaz (1991). Dinter (2009: 336) also favored this view by preferring to keep the two genera *Cynoglossum* and *Paracaryum* Boiss. separate "for the time being." A broader concept by Johnston (1924b) included the genera *Solenanthus* Ledeb., *Lindelofia* Lehm., *Kuschakewiczia* Regel & Smirn., and *Trachelanthus* Kunze. In the extremely broad concept by Greuter (1981), *Cynoglossum* (as three subgenera) included not only *Solenanthus*, but also *Rindera* Pallas (= *Mattia* Schult.) and *Paracaryum* (including *Mattiastrum* (Boiss.) Brand). Valdés (2004) used a similar broad concept that included the additional genera *Suchtelenia* Kar. ex Meisn. and *Trachelanthus*. A narrower approach was initiated by Popov (1953), who distinguished the new genus *Paracynoglossum* Popov, which was later justified by Mill and Miller (1984), and suggested detaching also the North American and Australian species, which was realized in part by Mill (1989) with his segregation of *Cynoglossum latifolium* R. Br. as the genus *Austrocynoglossum* Popov ex R. R. Mill). Barbier and Mathez (1973) separated a group of mainly northwestern African species in the genus *Pardoglossum* Barbier & Mathez, which Greuter (1981) later recognized as *Cynoglossum* subg. *Mattiaria* (Coss.) Greuter. Apparently the phylogenetic analysis of DNA sequences is needed to provide a more satisfactory resolution.

Hilger's (1985) studies of fruit micromorphology of Boragineae and the recently published concept by Hilger et al. (2005), using arguments based on the latest molecular studies in the family Boraginaceae, corroborate this tendency toward smaller genera. A consequence of the work of Mohr et al. (2008) must be nomenclatural changes for the North American *Cynoglossum* species. The suggested separation of the most differentiated species, *C. pringlei* Greenm., as the new genus *Oncaglossum* Sutorý is described here and will be followed by nomenclatural changes for other North American *Cynoglossum* species.

The description of the new genus *Oncaglossum*, based on the Mexican species *Cynoglossum pringlei*, is supported not only by its unique and conspicuous morphological characters, but also by its relatively isolated geographical position and occurrence in an area already conspicuous for its endemism, within four neighboring states of central Mexico (México D.F., Michoacán, Jalisco, and Guanajuato). This distribution is restricted to the Transmexican Volcanic Belt biogeographic province (Morrone, 2005), known for its large number of endemic species (Marshall & Liebherr, 2000; Nivei, 2008).

Villaseñor (2004) and Campos Ríos and Lira Charco (2008) recently reported the following species of *Cynoglossum* from Mexico: *C. henricksonii* L. C. Higgins (Higgins, 1976b), *C. mexicanum* Schltdl. & Cham., and *C. hintoniorum* B. L. Turner. *Cynoglossum henricksonii* [= *C. erectum* L. C. Higgins, nom. illeg. (Higgins, 1976a)] belongs to the synonymy of *C. creticum* Mill., a species quite common in the Mediterranean region of Europe. The occurrence of the latter species in Mexico is—similar to its occurrence in South America (Reiche, 1907; Brand, 1921; Johnston, 1924a)—of secondary origin analogous to the Asian species *C. amabile* Stapf & J. R. Drumm. *Cynoglossum mexicanum* was previously transferred to the genus *Hackelia* Opiz of the

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neighboring tribe Eritrichieae (= Cryptantheae) as *H. mexicana* (Schltdl. & Cham.) I. M. Johnst. *Cynoglossum hintoniorum* has to be transferred to this genus as well, and the combination is made below. The only native species that can be assigned to this genus in Mexico is the species under current study, *C. pringlei*. The nearest occurrence of species currently classified in *Cynoglossum* is situated far to the north, where *C. grande* Douglas ex Lehm., *C. virginianum* L. (including *C. boreale* Fernald), *C. occidentale* A. Gray, and *C. viride* Eastw. occur, and all are currently placed in *Cynoglossum* subg. *Eleutherostylum* (Brand) Riedl. Their distribution extends all the way up the Pacific coast from the Mexican border to Canada and, in one instance (*C. virginianum*), across to the eastern states of Canada and the United States. The generic placement of these North American species presumably in *Cynoglossum* is presently under review. According to Mohr et al. (2008), on the basis of molecular markers they belong to a separate monophyletic group next to the Eurasian/North African one. Other genera included in this clade belong to the tribe Eritrichieae (*Cryptantha* Lehm. ex Fisch. & C. A. Mey., *Plagiobothrys* Fisch. & C. A. Mey., *Amsinckia* Lehm., and *Pectocarya* DC.).

According to Villaseñor (2004), the tribe Cynoglosseae in Mexico includes, apart from the proposed genus *Oncaglossum*, three other indigenous genera: *Mimophytum* Greenm. (one species), *Omphalodes* Mill. (five species), and *Pectocarya* (seven species).

Hackelia hintoniorum (B. L. Turner) Sutorý, comb. nov. Basionym: *Cynoglossum hintoniorum* B. L. Turner, Phytologia 79(4): 306. 1995 [1996]. TYPE: Mexico. Oaxaca: Distr. Miahuatlán, Cerro Quiexobra, 3145 m, 19 Oct. 1995, *G. B. Hinton et al. 26206* (holotype, TEX 253).

Key to North American Genera of the Tribe Cynoglosseae (Adapted after Johnston, 1924a)

1a. Dorsal surface of nutlets naked or occasionally covered with uncinate appendages, with a callous or chartaceous margin that is entire or serrate or with uncinately tipped subulate teeth or appendages.
  2a. Fruiting pedicels nodding or reflexed, coarse, stiff, shorter than nutlets, corolla minute, tubular or salverform, gynobase with subcordate apex, nutlets flat or convex and somewhat ovate or elongate . . . . . *Pectocarya*
  2b. Fruiting pedicels various, usually flexuous, much longer than nutlets, corolla usually conspicuous, subrotate or rotate-tubular, gynobase conical, nutlets with cupulate margins . . . . . *Omphalodes*
1b. Dorsal surface of nutlets rather uniformly covered with glochidiate filiform or subulate appendages, rarely marginated and then merely by a wrinkle in the pericarp.
  3a. Nutlets lenticular, very depressed, cicatrix on the base of the ventral part of nutlets, cauline leaves on slender petioles at least half as long as the deeply cordate blades, plants weak and trailing . . . . . *Mimophytum*
  3b. Nutlets turgid, usually ± compressed ovoid, cicatrix in the upper part of the ventral part of nutlets, cauline leaves sessile or on very short winged petioles that are very much shorter than the linear to oblanceolate blades, plant erect.
    4a. Calyx not imbricated, with green, oblong sepals, corolla lobes ovate, anthers inserted in the corolla tube, stigma club-shaped or inversely conical . . . *Cynoglossum* (subg. *Eleutherostylum*)
    4b. Calyx with imbricate, colored, and broadly ovate sepals, corolla lobes reduced to narrow strips, anthers on short filaments inserted on the corolla margin, stigma in form of lenticular disc . . . . . *Oncaglossum*

Oncaglossum Sutorý, gen. nov. TYPE: *Oncaglossum pringlei* (Greenm.) Sutorý [≡ *Cynoglossum pringlei* Greenm.].

Genus novum inter genera Americae borealis tribus Cynoglossearum *Cynoglosso* L. (subg. *Eleutherostylo* (Brand) Riedl) affine, sed ab eo sepalis imbricatis atropurpureis late ovatis, lobis corollinis in lacinias angustas reductis, antheris filamentis brevibus ad marginem corollae insertis insidentibus, stigmatis forma disco lenticulari atque granis pollinis tricolporatis in parte polari apertura additicia praeditis distinguitur.

Oncaglossum pringlei (Greenm.) Sutorý, comb. nov. Basionym: *Cynoglossum pringlei* Greenm., Proc. Amer. Acad. Arts Sci. 40: 30. 1904. TYPE: Mexico. México: Fultenango Cañon, 2500 m, 9 Oct. 1902, *C. G. Pringle 11350* (holotype, GH). Figure 1A.

Additions to the features of the original description by Greenman (1904) appear in italics.

Perennial herbs to 1–1.5 m high, taproot massive, stems leafy up to the inflorescence, striate, hirsute-pubescent. Stem leaves sessile, semi-amplexicaul, oblong-lanceolate, 3–12*(–16)* × 1–4*(–7)* cm, acute, entire, dark green adaxially, paler abaxially, hirsute-pubescent on both surfaces. Inflorescence compound, many-flowered, ± bracteate; pedicels 0.5–2 cm, recurved at least in later stages, appressed pubescent; calyx 5-lobed, calyx lobes *dark purple*, 2.5–6 mm, *broadly ovate to almost round*, imbricate, glabrous *outside* except *for closely adpressed pubescence* at the very base, *on inner side with short stout trichomes*; *corolla green to lemon yellow when young, later brown, ca. 4 mm, corolla lobes narrow, separated, ca. 2 × 0.5–*

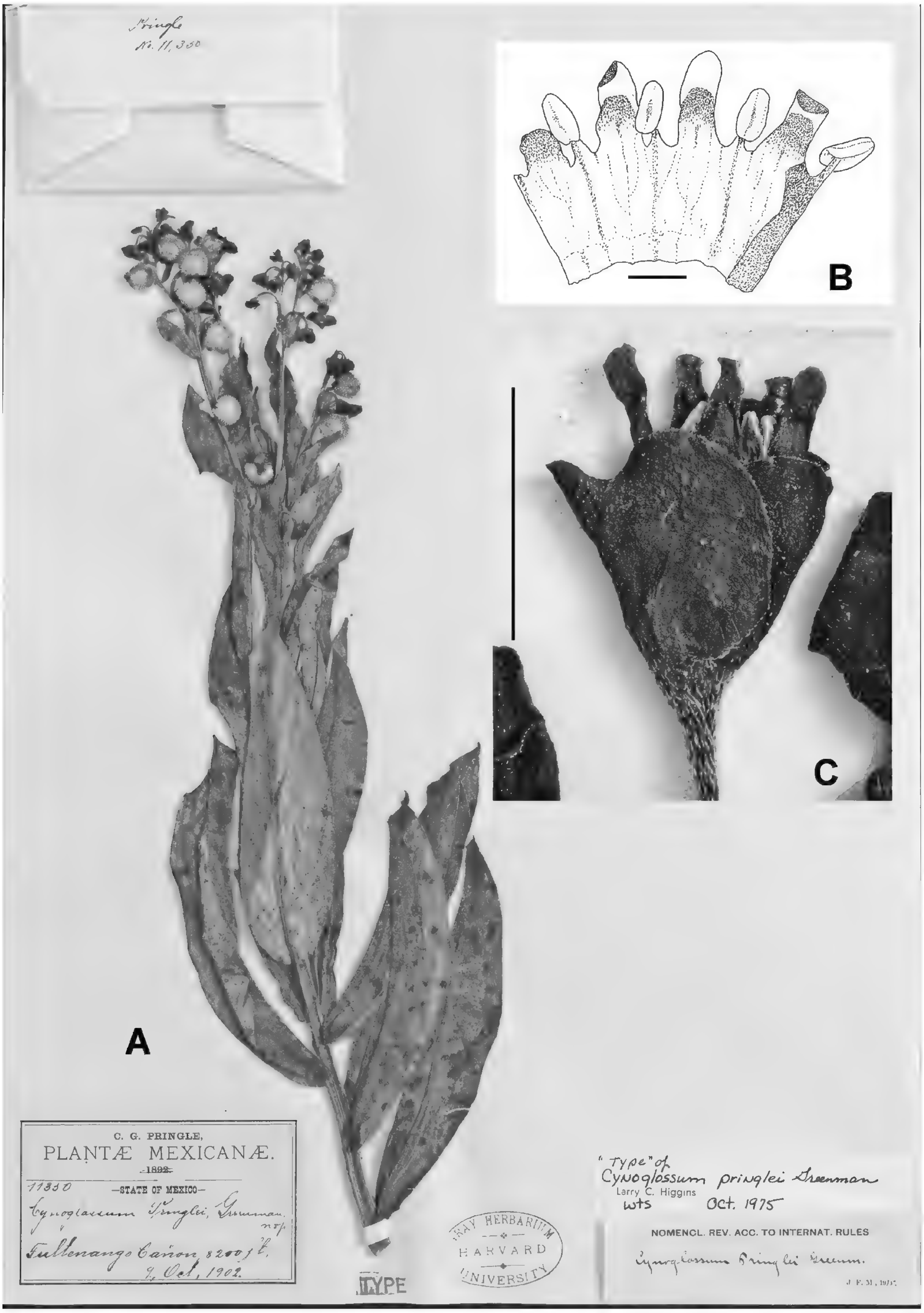

Figure 1. *Oncaglossum pringlei* (Greenm.) Sutorý. —A. Holotype (*Pringle 11350*, GH). —B. Dissected corolla (*Leavenworth s.n.*, GH). —C. Flower (*Leavenworth s.n.*, GH). Scale bars: B = 1 mm; C = 5 mm.

0.7 mm, slightly shorter than corolla tube, faucal scales trapezoid, as wide as corolla lobes and 0.5–0.6 mm long; anthers ca. 1 mm on ca. 0.3–0.4 mm filaments inserted on the margin of the corolla between the corolla lobes, below the faucal scales; style 1.5–2 mm, persistent, round *in cross section; stigma in form of lenticular disc, ca. 0.2 mm diam. with long sparse papillae. Ripe nutlets perfectly separated from style,*

broadly ovate or subrotund, dorsiventrally compressed, 10–12 mm long, nearly or quite as broad as long, *without elevated margin, glochids becoming gradually smaller and infrequent toward the convex middle and toward the top*, glochidiate-hispid on the upper or outer surface, smooth beneath, *glochids 0.5–1 mm*; *attachment* scar *apical*, triangular-ovate, ca. *3 × 2 mm. Pollen grains oblong, 9.5–11.5 μm, tricolporate, apertures not connected in an equatorial plane.*

Etymology. The new genus is named after the jaguar, *Panthera onca* L., a beast of prey worshipped by the pre-Columbian Mexican tribe, the Olmec.

Discussion. This monotypic genus is related to the North American species presently classified in *Cynoglossum* subg. *Eleutherostylum*. It differs in the calyx possessing imbricate, colored, and broadly ovate to almost round sepals (vs. green, oblong-lanceolate or oblong in subgenus *Eleutherostylum*), the corolla lobes reduced to narrow strips (vs. not reduced, rounded or oblong lobes), the anthers on short filaments inserted on the corolla margin in conspicuous gaps between the petals (vs. filaments inserted in the corolla tube), the stigma in the form of a lenticular disc (vs. club-shaped or inversely conical), and the smaller tricolporate pollen grains with colpi and colpori not connected in an equatorial plane distinctly differing in size and shape and with an additional aperture in their polar region.

Johnston (1924a: 32, 33) gives further information: "Although closely related to *Cynoglossum officinale* this species, a native of south central Mexico, is clearly distinct in its larger and differently shaped nutlets and short style. Frequently only a single nutlet is matured from each flower." In his key to species, he erroneously groups *C. pringlei* under plants with "nutlets sunken in dorsally and having a definite elevated margin." Nutlets in *C. pringlei* lack an elevated margin as formed in *C. officinale* and other *Cynoglossum* and *Solenanthus* species (Fig. 2C, D), but some immature fruits may form this margin secondarily when dried.

Cynoglossum pringlei was recorded for the first time by Sessé and Mociño on the expedition through the Michoacán (Moldano Polo, 2004) and later published under the illegitimate name *C. appeninum* Sessé & Moc. (Sessé & Mociño, 1891–1897). Brand (1921), monographer of the genus *Cynoglossum*, and Riedl (1962), in his later overview, did not see *C. pringlei* and placed it in their Species incertae sedis. R. R. Mill, on his identification labels in Kew dated 19 March 1983, used the never validly published combination *Eleutherostylum pringlei* (Greenm.) R. R. Mill, which better corresponds to the classification of this taxon.

The new genus is a natural evolutionary unit and differs from all other genera in the tribe Cynoglosseae by the following characters:

- The calyx has imbricate, colored, and broadly ovate to almost rounded sepals (Fig. 1C). Brand (1921) mentions for this tribe ovate and obtuse or linear-lanceolate, more or less acute sepals. They are normally green and not overlapping.
- The corolla lobes are reduced to narrow strips (Fig. 1B) and separated by conspicuous gaps with inserted stamens. In this tribe the corolla lobes are mostly broadly ovate or almost rounded (Brand, 1921). Only some species of *Rindera* have linear lobes, which is exceptional for this tribe, but that genus differs from *Oncaglossum* in many other characters (e.g., winged fruits, the shape of the style and inflorescence).
- Anthers are on short filaments, inserted on the margin of the reduced corolla. The point of insertion is actually similar to other Cynoglosseae, but the strong reduction of the corolla positions the anthers marginally. In all genera in the Cynoglosseae, the filaments are inserted inside the corolla tube at least at its top (Brand, 1921: 7).
- The stigma forms a lenticular disc, ca. 0.2 mm diam., with sparse, long papillae. In North American species of *Cynoglossum* subg. *Eleutherostylum*, the stigma is inversely conical or club-shaped with a flattened distal part, always with short papillae.
- The pollen grains are tricolporate, i.e., having three compound apertures (colpori) alternating with three simple apertures (pori). The colpi and colpori are distinctly different in shape and size in *Oncaglossum* and are not connected in an equatorial plane. They are of the same type as pollen grains of most North American species of subgenus *Eleutherostylum* (*Cynoglossum virginianum*, *C. viride*, and *C. occidentale*), but differ by having an aperture in the polar region (Fig. 2A, D) and by the dimension of the pollen grains (9.5–11.5 μm vs. 14–20 μm in the North American species of subgenus *Eleutherostylum*). Similar apertures in the polar region are known within the Boraginaceae, but only from the Eritrichieae, namely in *Cryptantha intermedia* (A. Gray) Greene (Hargrove & Simpson, 2003) and in species of *Hackelia* (Gentry & Carr, 1976). Pollen grains in *Solenanthus* are of a similar type, but differ by the almost rounded grain shape. The genus *Pardoglossum* has extremely distinctive pollen grains that are quite different from any other Cynoglosseae (Barbier & Mathez, 1973; Mathez, 1974). *Cynoglossum grande*, together with other Eurasian

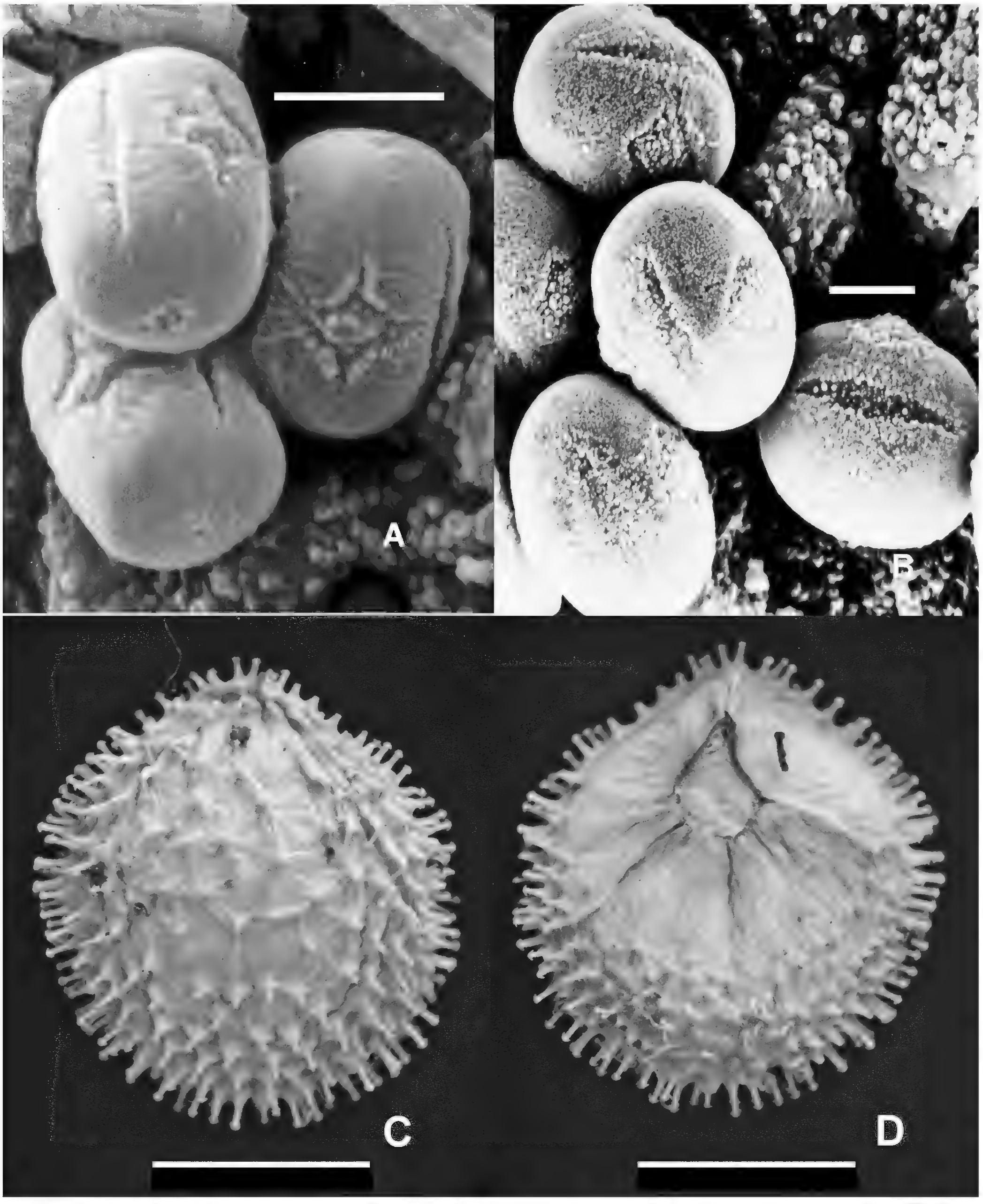

Figure 2. A, B. Pollen grains. —A. *Oncaglossum pringlei* (*Leavenworth s.n.*, GH). —B. *Cynoglossum occidentale* (*Gray s.n.*, MO 1300349). C, D. *Oncaglossum pringlei*, nutlets. —C. Dorsal part (*Pringle 11350*, GH). —D. Ventral part (*Pringle 11350*, GH). Scale bars: A, B = 5 μm; C, D = 5 mm.

species of *Cynoglossum* and the related *Paracynoglossum*, has a more or less developed equatorial connection of the apertures (Barbier & Mathez, 1973; Mathez, 1974; Sahay, 1979; Liu et al., 2001).

- The large nutlets (10–12 mm long) in *Oncaglossum* are similar to those of *Cynoglossum* and *Solenanthus*, but the whole dorsal portion is unique in its shape (Fig. 2C). Glochids are of different length (0.5–1 mm) and are irregularly distributed on the

surface of the nutlet. They become gradually smaller and infrequent toward the convex middle (and toward the top) without creating a distinct margin or flat areole. The geographically closest North American species of *Cynoglossum* subg. *Eleutherostylum* differ in having nutlets that are not or only slightly dorsiventrally compressed and with glochids that are equally long and regularly densely distributed over the entire surface.

Specimens examined. MEXICO. **Guanajuato:** Cuchilla del Pajarito, ca. San Luis de los Augustinos, Mpio. Acámbaro, 2400 m, 20 July 1987, *H. Díaz-Barriga 4048* (MEXU 559042). **Jalisco:** Sierra del Tigre, 3 mi. S of Mazamitla, 2100–2200 m, 16 Sep. 1952, *R. McVaugh 12933* (GH); Gómez Farías, 15 km al NE de Cd. Guzmán, carr. a San Andrés Ustlán, luego 19 km al E por brecha a Concepción de Buenos Aires, 1980 m, 2 Sep. 1988, *M. Fuentes 621* (MEXU 602461); 16–17 km al NE de Cuautitlan, Cerro El Almeal, 19°33′58″N, 104°15′25″W, 2050–2120 m, 22 July 1988, *R. Cuevas Guzman L. 3164* (MEXU 668715); pine-oak woods, 7000 ft. near Tapalpa, 7 Aug. 1969, *Anonymous 71004* (K [R. R. Mill annot., *Eleutherostylum pringlei* (Greenm.) R. R. Mill, 19 Mar. 1983]); Cerro de Talcozaqua [Sierra de Tapalpa], 2–3 km E of Tapalpa [ca. 19°57′N, 103°45′W], ca. 2000 m, 5–7 Aug. 1960, *H. H. Iltis, R. Koepen, F. Iltis* (MEXU 56219); Jocotepec, Ladera S del Cerro Viejo, NE de Potrerillos, 31 July 1994, *J. A. Machuca, M. Cházaro 7130* (MEXU 991163). **Michoacán:** Morelia (Michoacán) et de Moro Leon (Guanajuato), 1893, *A. Duges s.n.* (GH); vic. of Morelia, Cerros San Miguel, 2100 m, 15 Sep. 1910, *G. Arsène 5949* (BM, GH, MPU); Sierra Torricillas, 2200 m, 26 July 1939, *G. B. Hinton s.n.* (GH); Tancitaro, at Pedregal lava flow 2 mi. S of Tancitaro, 6500 ft., 14 Aug. 1940, *W. C. Leavenworth s.n.* (GH, TEX-Lundell Hb.); Distr. Coalcoman, Llano, Sierra Torricillas, 2250 m, 28 July 1941, *G. B. Hinton 15930* (K [R. R. Mill annot., *Eleutherostylum pringlei* (Greenm.) R. R. Mill, 19 Mar. 1983, unpublished ms. name]); Mpio. Coeneo, 2 km al NE de la deviación a Bellas Fuentes, 1970 m, 5 July 1986, *H. Díaz Barriga 2403* (MEXU 1110944); bosque de encino 3 km al N de Santiago Azajo, Mpio. Coeneo, 2080 m, 14 July 1988, *Pio X. Ramos 141* (MEXU 807447); Santa Clara del Cobre, sobre el camino al Cerro de la Cantera, 2200 m, 11 Aug. 1988, *E. Pérez Calix 156* (MEXU 813605).

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Rubiacearum Americanarum Magna Hama Pars XXIV: New Species of Central and South American *Bouvardia*, *Hillia*, *Joosia*, *Ladenbergia*, *Pentagonia*, and *Posoqueria*

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Abstract. Recent Neotropical exploration and floristic studies have continued the discovery of species of Rubiaceae new to science, including the six species described here: *Bouvardia costaricensis* C. M. Taylor of central Costa Rica is distinguished by its foliaceous enlarged calyx lobes and long white salverform corollas; *Hillia pumila* C. M. Taylor of dwarf montane forests in central Peru is distinguished by its quite small leaves and stipules; *Joosia antioquiana* C. M. Taylor of northwestern Colombia is distinguished by its long stipules, leaves with numerous secondary veins, and four entire (i.e., unornamented) corolla lobes; *Ladenbergia franciscana* C. M. Taylor of southern Ecuador is distinguished by its calyptrate stipules, small, mostly obtuse leaves, and shallowly lobed calyx limb; *Pentagonia osaensis* C. M. Taylor of southern Costa Rica is distinguished by its dense pilosulose to velutinous pubescence and its subtruncate to very shallowly lobed calyx limb; and *Posoqueria laevis* C. M. Taylor of Panama is distinguished by its leaves with the secondary and higher-order venation not visible.

Resumen. Recientes exploraciones y estudios florísticos neotropicales han seguido con el descubrimiento de especies de Rubiaceae nuevas para la ciencia, incluidas las seis especies descritas a continuación: *Bouvardia costaricensis* C. M. Taylor, del centro de Costa Rica, se distingue por sus lóbulos del cáliz agrandados y foliáceos y la corola larga, blanca, hipocraterimorfa; *Hillia pumila* C. M. Taylor, de los bosques montanos enanos del centro de Perú, se distingue por sus hojas y estípulas muy pequeñas; *Joosia antioquiana* C. M. Taylor, del noroeste de Colombia, se distingue por sus estípulas largas, hojas con numerosas nervaduras secundarias y cuatro lobos de la corola enteros (es decir, no ornamentados); *Ladenbergia franciscana* C. M. Taylor, del sur de Ecuador, se caracteriza por su estípulas caliptradas, las hojas pequeñas y mayormente obtusas y el limbo del cáliz ligeramente lobulado; *Pentagonia osaensis* C. M. Taylor, del sur de Costa Rica, se distingue por la densa pubescencia pilósula a velutina y el limbo calicino subtruncado a muy ligeramente lobulado; y *Posoqueria laevis* C. M. Taylor de Panamá se distingue por sus hojas con la nervadura secundaria y de orden superior no visible.

Key words: *Bouvardia*, Cinchoneae, Colombia, Costa Rica, Ecuador, Hedyotideae, Henriquezieae, *Hillia*, Hillieae, Hippotideae, IUCN Red List, *Joosia*, *Ladenbergia*, Panama, *Pentagonia*, Peru, *Posoqueria*, Posoquerieae, Rubiaceae, Spermacoceae.

During study of specimens of Neotropical Rubiaceae, the new species described below were discovered among specimens made by projects focused on floristic study of tropical forest regions that are not well known to science, with most of the collections made within the last 15 years. Additional collection data for the specimens cited here and high-resolution digital images of the type specimens are available on the Internet at <http://www.tropicos.org>.

Conservation status assessment methodology. The study presented here is taxonomic and floristic: the objective is enumeration of the species that belong to various Rubiaceae genera and the species that occur in the area of tropical Central and South America. The methods employed here correspond only to this objective; thus this study is based on survey of specimens collected over a number of years using varied survey methods aimed at various objectives. The specimens here used to delineate the range and commonness of these new species were located through a non-exhaustive survey of several herbaria, and no field studies have been done targeting the occurrence of these species where they are known or expected to grow. Thus the floristic information presented here is a simplified presence report based on incomplete survey of the available data, which are uneven and incomplete for this region (Schulman et al., 2007). Knowledge of the true geographic range and the population size and dynamics of a species are essential to understanding the threats to its existence, and thus to understanding its actual conservation status; documentation of the existence of a species

based on one or several museum collections does not provide adequate data to evaluate these factors. Conservation assessments are provided here for these newly described species using IUCN categories and criteria (IUCN, 2001) based on the totality of our current knowledge. The basis for these assessments in the form of a map and the calculated assessment parameters are available under the corresponding species names at <http://www.tropicos.org> (assessment parameters for each map can be seen using "Show Detail"). The assessment parameters were calculated using the IUCN Rating tool (Moat, 2007) in ArcView GIS 3.2 (ESRI, 1999), with the grid cell size used for calculating Area of Occupancy (AOO) varied between 1.00 and 3.16 km depending on characteristics of the species and data (IUCN Standards and Petitions Working Group, 2008). These assessments are not being submitted to the IUCN for publication in the Red List (<http://www.iucnredlist.org>), and the basis for these assessments should be carefully evaluated by the reader.

Bouvardia

This Mexican and Central American genus of shrubs and herbs is recognized by its opposite or verticillate leaves; the persistent interpetiolar stipules that are fused to the bases of the adjacent petioles and are often setose or laciniate; the several-flowered cymose inflorescences that are generally terminal and bracteate; the distylous, rather showy flowers with white or brightly colored corollas with the four lobes valvate and the tube usually well developed; and the stiffly papery capsular fruits that are loculicidal and contain numerous flattened, winged, thinly papery, orbicular seeds. *Bouvardia* Salisb. has sometimes been classified within the Rubiaceae in the tribe Cinchoneae (Robbrecht, 1988), but most recently has been considered to belong to the Hedyotideae (Andersson & Persson, 1991; Andersson et al., 2002) or the expanded tribe Spermacoceae s.l. (including the Hedyotideae; Groeninckx et al., 2009).

Bouvardia was last studied comprehensively by Blackwell (1968), who recognized 31 species with most restricted to Mexico, and several additional species have been described subsequently from that country. Additionally, one Mexican species currently treated as *Arcytophyllum serpyllaceum* (Schltdl.) Terrell has been suggested, based on molecular data, to be more closely related instead to *Bouvardia* (Andersson et al., 2002). Blackwell recognized three subgenera of *Bouvardia*, based on leaf arrangement, inflorescence arrangement, and corolla details.

The arrangement of the inflorescences in *Bouvardia* is basically cymose, and has been described somewhat differently by different authors. Blackwell (1968) described the inflorescences as composed of solitary flowers or "partial inflorescences," which he defined as a "flower or group of flowers, and their pedicels and peduncle, arising from each leaf-axil of the terminal 1 to 4 leaf-pairs of a floriferous stem tip" (1968: 3). Here he used the term "pedicel" to refer to the structure immediately supporting the flower, connecting that flower to either the peduncle or the stem. However, some other authors describe inflorescence structures differently in *Bouvardia*, in particular following the terminology of Lawrence (1951: 764) and using the term "peduncle" instead of "pedicel" for the supporting structure of a solitary flower, which is assumed to represent a reduced cyme. Some authors have also described for *Bouvardia* the overall inflorescence in terms of branching pattern, instead of the partial inflorescences (e.g., Lorence, 1994). In several species of *Bouvardia*, the structure supporting the solitary flower is articulated near the middle and sometimes even bears reduced bracts at this articulation: this solitary flower is assumed in *Bouvardia* to represent a reduced cyme (Blackwell, 1968), with the portion of its supporting structure below the articulation corresponding to the former peduncle and the portion above the articulation corresponding to the former pedicel. Such articulated supporting structures have been variously described as pedicels (Blackwell, 1968: *B. glabra*, p. 19; Lorence, in prep., *Flora Mesoamericana*), described as peduncles (Taylor & Lorence, in prep., *Manual de Plantas de Costa Rica*), or have had the sections described separately as the peduncle and the pedicel (Lorence, in prep., *Flora Mesoamericana*). Below, the structure that supports a flower and connects it directly to the stem is described as a peduncle, whether articulated or not, and the overall inflorescence is described rather than the partial inflorescences.

Bouvardia costaricensis C. M. Taylor, sp. nov. TYPE: Costa Rica. San José: cantón de Acosta, Fila Bustamante, Hacienda Tiquires, 9°44′N, 84°11′W, 1000 m, 24 May 1995, *M. M. Chavarría & A. Solís 848* (holotype, INB; isotype, MO-6110554). Figure 1C.

Haec species a congeneris calycis lobis ellipticis vel lanceolatis 20–25 × 8–11 mm atque corollae albae tubo 70–80 mm longo distinguitur.

Subshrubs or shrubs to 4 m tall, glabrous or glabrescent throughout. *Leaves* opposite; blades lanceolate, 7–11.5 × 2–4 cm, drying papery, base acute to rounded, apex acute to acuminate; secondary veins 5 to 6 pairs, sometimes broadly looping or reticulating to interconnect near margins; *petioles* 2–11 mm;

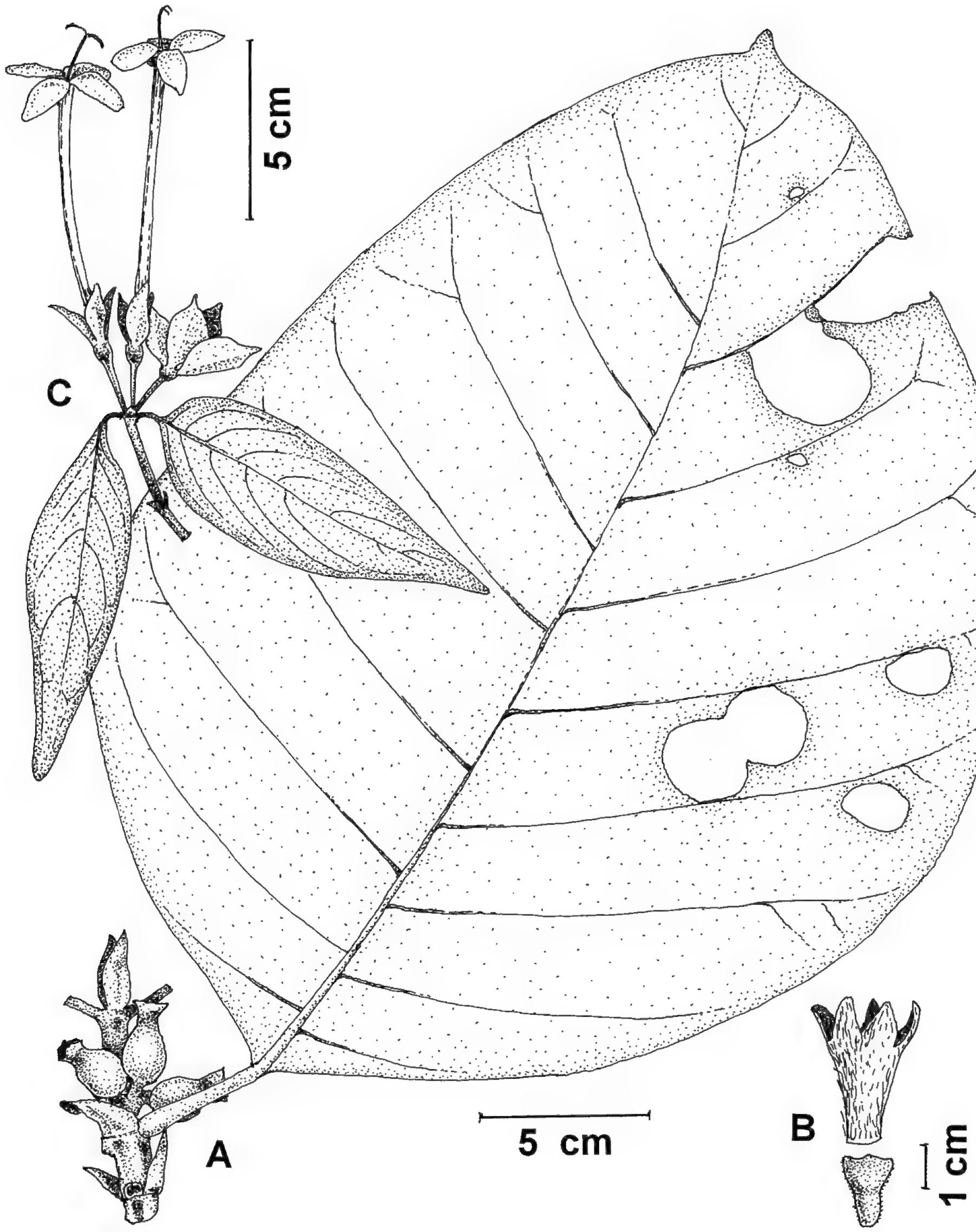

Figure 1. A, B. *Pentagonia osaensis* C. M. Taylor. —A. Portion of fruiting stem; based on the paratype *Morales 3945* (MO). —B. Flower, partially dissected; based on the type *Hammel et al. 16823* (MO). —C. *Bouvardia costaricensis* C. M. Taylor, portion of flowering stem, with two flowers with mature corollas and one flower from which the corolla has fallen; based on the type *Chavarría & Solís 848* (MO).

stipules broadly triangular, 2–3 mm, entire or with 3 or 5 lobes with central lobe markedly longer. *Inflorescences* terminal and sometimes also in axils of uppermost leaves, 3- or 5-flowered, fasciculate-cymose; peduncles 10–25 mm, sometimes articulated near middle, sometimes at the articulation with bracts 2–3 mm, stipuliform. *Flowers* with ovary ellipsoid or turbinate, 3–4 mm; *calyx* limb divided essentially to base, lobes 4, elliptic to lanceolate, 20–25 × 8–11 mm, acute to shortly acuminate, costate or weakly trinerved; *corolla* white, salverform, tube cylindrical, 70–80 mm, 2.5–3 mm diam., lobes elliptic to lanceolate, 12–15 × 7–8 mm, obtuse to acute, abaxially puberulous; *anthers* narrowly ellipsoid, ca. 5 mm, included with tips positioned ca. 3 mm below top of corolla tube; *stigmas* linear, ca. 7 mm, exserted by 10–15 mm from corolla tube. Immature *fruit* subglobose, 7–8 × 10–12 mm, laterally somewhat flattened, with calyx lobes persistent.

Habitat, distribution, and phenology. *Bouvardia costaricensis* is known from moist forests at 1000–1900 m in central Costa Rica; it has been collected in flower in May, June, and August, and in immature fruit in September.

IUCN Red List category. This species meets the geographic range criteria for Endangered, based on the few known localities and small overall area, and only one of the known localities is within a legally protected area. The habitat in which it is found is in general under threat from development and is declining; however, this species appears to grow in secondary vegetation and has been collected frequently in recent years, so it may not fulfill the subcriterion of continuing decline in species-specific habitat. However, all the known localities for *Bouvardia costaricensis* are relatively close together, so the species could be threatened by a stochastic event such as rapid overall habitat destruction and is here evaluated as Vulnerable due to restricted range: VU D2.

Discussion. This new species is similar in general aspect to *Bouvardia glabra* Pol. and *B. longiflora* (Cav.) Kunth, both of which also have salverform white corollas with well-developed tubes and similarly shaped lobes. However, *B. costaricensis* is separated from these other species by its generally longer corolla, its markedly larger calyx lobes, and its several flowers borne on well-developed peduncles or pedicels; in contrast, *B. glabra* has corolla tubes 15–70 mm long, narrowly triangular or narrowly elliptic calyx lobes 0.5–5 mm wide, and cymose inflorescences with the pedicels 0.5–19 mm long, and *B. longiflora* has corolla tubes 35–85 mm long, linear to linear-lanceolate or oblanceolate calyx lobes 1–4 mm wide, and the flowers solitary or in groups of two or three and subsessile or on reduced peduncles, to about 1 mm long. The corollas vary markedly in length within each of these last two species and may vary similarly in *B. costaricensis*. This is the only species of *Bouvardia* that is restricted to Costa Rica, and the name refers to its geographic distribution.

Bouvardia costaricensis belongs to *Bouvardia* subg. *Bouvardioides* Schltdl. (Blackwell, 1968) based on its paired leaves, salverform white corollas with well-developed tubes and the lobes spreading at ca. 90°, and few-flowered inflorescences with the partial inflorescences reduced to a single flower. This last condition is shown by the peduncles produced in the leaf axils that are articulated, and represent a reduced 3-flowered cyme. Often three peduncles without evident articulations are borne together at the stem apex, and apparently comprise an unreduced cyme.

Paratypes. COSTA RICA. **San José:** R.F. Los Santos, cuenca del Naranjo y Paquita, *B. Hammel & I. Pérez 23735* (INB, MO); Z.P. Cerros de Escazú, cuenca del Pirrís-Damas, *R. Kriebel & D. Cordero 1309* (INB, MO); cantón de Acosta, Fila Bustamante, en la falda N de Loma León 7 Alto Reflis, *J. F. Morales 4220* (INB, MO).

Hillia

The Neotropical genus *Hillia* Jacq. comprises about 25 species of fleshy, erect to climbing epiphytes found in wet forests from sea level to 2400 m elevation, and from Mexico and the Antilles through to both Bolivia and southeastern Brazil (Taylor, 1994). *Hillia* is distinguished by its capsular fruits; its flattened seeds that bear a tuft of filaments 1–3 cm long at one end; its epiphytic habit; its well-developed, ligulate to lanceolate, caducous interpetiolar stipules; and its showy, usually solitary flowers. The relationships of this genus have been shown based on morphological analysis to be with *Cosmibuena* Ruiz & Pav., and these two genera were included in the tribe Hillieae (Andersson, 1995). More recently, both of these genera have been included based on molecular data in the Neotropical tribe Hamelieae (Robbrecht & Manen, 2006). Several species with similar fruits, seeds, and habit but with red flowers were previously separated in the genus *Ravnia* Oerst., but have more recently been included in *Hillia* based on vegetative and fruit morphology (Taylor, 1989, 1994).

Hillia pumila C. M. Taylor, sp. nov. TYPE: Peru. Pasco: Oxapampa, dist. Chontabamba, La Suiza Nueva, bosque achaparrado con suelo muy húmedo [dwarf forest with very wet soil], 10°39′S, 75°27′W, 2200 m, 1 Nov. 2006, *R. Rojas, R. Vásquez & B. Vásquez 3996* (holotype, USM; isotypes, HOXA, HUT, MO-6173589). Figure 2B.

Haec species a *Hillia parasitica* Jacq. foliis minoribus, stipulis minoribus acutis saepe costatis atque floribus minoribus distinguitur; etiam in nebulisylva nana Peruviae centralis invenitur.

Weak to climbing shrubs to 1.5 m tall, epiphytic or apparently terrestrial on saturated soils, glabrous generally throughout; bark gray to reddish brown, smooth. *Leaves* opposite; blades elliptic to lanceolate-elliptic, 1.6–3.5 × 0.9–2 cm, drying stiffly papery, base obtuse to rounded, apex acuminate with tip 2–8 mm; midrib plane to impressed adaxially, plane to thickened abaxially; secondary veins pinnate, 3 to 4 pairs, visible but plane on both surfaces; margins plane to thinly revolute; *petioles* 3–7 mm; *stipules* lanceolate, 3–9 × 1–3 mm, smooth or usually weakly to distinctly costate, rounded to usually acute or

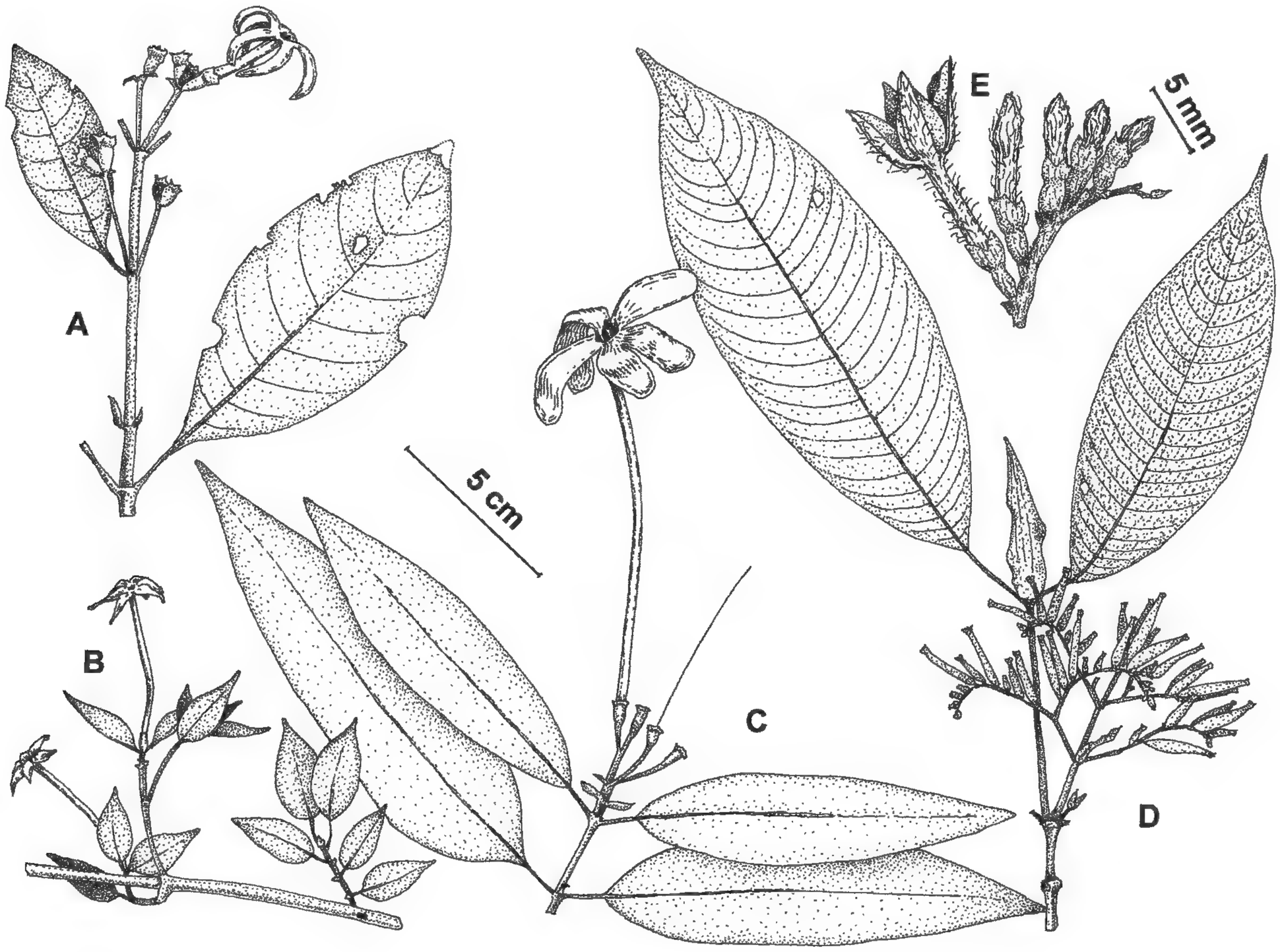

Figure 2. —A. *Ladenbergia franciscana* C. M. Taylor, portion of flowering stem with one flower with mature corolla and seven flowers from which corollas have fallen; based on the type *Homeier & Kottke 1406* (MO). —B. *Hillia pumila* C. M. Taylor, portion of flowering stem with two flowers; based on the type *Rojas et al. 3996* (MO). —C. *Posoqueria laevis* C. M. Taylor, portion of flowering stem with one flower with mature corolla and four flowers from which corollas have fallen; based on the type *McPherson & van der Werff 19956* (MO). D, E. *Joosia antioquiana* C. M. Taylor. —D. Portion of fruiting stem; based on the paratype *Cárdenas et al. 2640* (MO). —E. Portion of inflorescence with one flower with corolla in process of opening and four immature buds; based on the type *Ramírez et al. 69* (MO). A–D to same 5-cm scale.

weakly acuminate. *Flowers* solitary, terminal, sessile or with peduncle to 1 mm; bracts similar in shape and size to stipules; ovary cylindrical, ca. 2 mm; *calyx* limb reduced to a minute low ridge; *corolla* white, salverform; tube 30–45 mm, often weakly curved; lobes 6, narrowly lanceolate to narrowly triangular, 12–15 × 3–4 mm, obtuse to acute; *anthers* 6, 3–4 mm, included, tips positioned ca. 3 mm below top of corolla tube; *stigmas* 2, subcapitate, ca. 0.8 mm, included, positioned next to tips of anthers. *Capsules* cylindrical, 50–95 × 5–7 mm including beak ca. 1 mm, smooth, not stipitate; seeds fusiform, ca. 4 × 1 mm, with trichomes 10–15 mm.

Habitat, distribution, and phenology. *Hillia pumila* is known from dwarf cloud forest at 2200–2500 m in central Peru; it has been collected in flower in September and November, and in fruit in February and July.

IUCN Red List category. This species meets the geographic range criteria for Critically Endangered based on the few known localities from a small overall area, but fails to fulfill the required subcriteria for this evaluation. However, all the known localities for *Hillia pumila* are relatively close together, so the species could be threatened by a stochastic event such as rapid habitat destruction and is here evaluated as Vulnerable due to restricted range: VU D2.

Discussion. This new species is similar to *Hillia parasitica* Jacq., but differs in the smaller size of its leaves, flowers, and stipules; the specific epithet refers to its smaller size. As in other species of *Hillia*, there is variation in flower size in *H. pumila*: the corolla tubes range from 30–45 mm long (i.e., 33% difference in length) on the flowers that are borne along a single branch of the type collection. *Hillia pumila* belongs to *Hillia* subg. *Hillia* (Taylor, 1994).

The similar species *Hillia parasitica* is wide-ranging and morphologically variable (Taylor, 1994), and the plants included here in *H. pumila* might represent a reduced form that grows in dwarf forest and thus arguably should be considered for recognition as a variety. However, these characteristically small plants have been collected in several different

localities, and their anthers are consistently smaller and their stipules differently shaped. These small plants differ markedly and consistently in these characters from the local populations of *H. parasitica*, and thus seem better considered a distinct species in Peru. *Hillia parasitica* has been collected in the same region (e.g., *D. N. Smith 4139*, 10°35′S, 75°30′W, 1830 m, disturbed edges of high montane forest, MO) with leaves 4–7 × 1.5–3 cm, ligulate to narrowly elliptic stipules 20–25 mm long, bracts ca. 50 mm long, corollas with the tube ca. 90 mm long and the lobes ca. 30 mm long, and anthers 6–8 mm long. *Hillia pumila* is also similar to *H. wurdackii* Steyerm., a montane species from northern Peru and southern Ecuador; however, *H. wurdackii* can be separated by its leaves with four to eight pairs of secondary veins that are prominent on the abaxial leaf surface, its obtuse to rounded stipules 14–40 mm long, its broader corolla lobes 12–26 × 9–12 mm, and its larger anthers 10–11 mm long.

Paratypes. PERU. **Pasco:** Oxapampa, dist. Huancabamba, Parque Nac. Yanachaga-Chemillén, sector San Daniel, *R. Vásquez, A. Monteagudo, A. Peña, J. Mateo & V. Flores 31094* (HOXA, HUT, MO, USM); Grapanazú, camino hacia la Laguna San Daniel, *S. Vilca C., E. Ortíz & J. Mateo M. 268* (HOXA, HUT, MO, USM).

Joosia

This Neotropical genus of shrubs and small trees is distinguished by its lineolate (i.e., regularly finely parallel) tertiary leaf venation, its well-developed interpetiolar stipules that are quickly deciduous, its cymose inflorescences, its salverform 4- or 5-lobed corollas, and its slender, cylindrical, septicidal capsules containing numerous flattened seeds. *Joosia* H. Karst. comprises about 12 species found in wet forests at low to middle elevations from southern Central America to Venezuela and Peru (Andersson, 1997a). The corollas are distinctive in their lobes that often have irregular crisped appendages borne along their margins, and a fleshy marginal wing that runs from either the apex of the corolla lobe or the base of the marginal appendages down to the base of this lobe. Andersson (1997a) revised the genus and recognized 11 species, with *J. umbellifera* H. Karst. distributed throughout the range of the genus and morphologically variable; the largest number of species are so far known from Ecuador. The genus has generally been included in the tribe Cinchoneae, which appears to be wholly Neotropical (Andersson & Antonelli, 2005).

Joosia antioquiana C. M. Taylor, sp. nov. TYPE: Colombia. Antioquia: San Luis, Quebrada La Cristallina, Bh-T, Bmh-T [Bosque húmedo Tropical, Bosque muy húmedo Tropical], 660–740 m, 8 Aug. 1985, *J. G. Ramírez, E. Rentería & O. Mesa 69* (holotype, JAUM; isotype, MO-05017430). Figure 2D, E.

Haec species a *Joosia umbellifera* H. Karst. stipulis longioribus acutis, foliis venis secundariis numerosioribus ad paginam inferiorem pubescentia sericea bene evoluta vestitis, inflorescentia infructescentiaque cymosis plerumque sat congestis, lobis corollinis 4 margine alatis elobulatis atque seminibus minoribus distinguitur; etiam in substratis e rupibus sedimentariis oriundis ut videtur crescens.

Shrubs and small trees to 8 m tall; stems glabrous or sericeous then quickly glabrescent. *Leaves* opposite; blades elliptic, 8–21 × 3–7.8 cm, drying stiffly papery to chartaceous, adaxially glabrous or often densely silky-lanose and eventually glabrescent, abaxially densely silky to silky-lanose sometimes to glabrescent on lamina, base cuneate to broadly obtuse, apex acuminate with tips 5–12 mm; secondary veins 12 to 28 pairs, adaxially plane to prominulous, abaxially prominulous, tertiary venation weakly to hardly visible adaxially, weakly to distinctly visible abaxially; *petioles* 10–30 mm; *stipules* caducous or deciduous after distalmost several nodes, narrowly ligulate-triangular, acute, at basalmost node of lateral branches 5–17 mm and glabrous, at other nodes 25–40 mm and densely puberulous to sericeous or silky-lanose. *Inflorescences* congested-cymose, branched to 1 to 2 orders, densely silky-strigillose to glabrescent; peduncle 1.2–3 cm; branched portion 2–3 × 5–8 cm, axes monochasial, flowers 5 to 12; bracts narrowly triangular or triangular-ligulate, 1–2 mm, deciduous. *Flowers* sessile or subsessile; ovary cylindrical, ca. 2 mm, densely sericeous-strigose and/or puberulous; *calyx* limb ca. 2 mm, densely to moderately silky-lanose and/or puberulous to glabrescent, irregularly lobed for ca. 1/2, lobes ligulate to triangular, obtuse to acute; *corolla* white, salverform, outside densely sericeous; tube ca. 10 mm; lobes 4, triangular to lanceolate, ca. 7 mm, acute, marginally entire, with wing ca. 1 mm wide; *anthers* and *stigmas* not seen. *Capsules* slenderly cylindrical, 7–20 × 2.5–3 mm, silky-lanose to glabrescent, old valves becoming twisted; seeds 1.5–3 × ca. 1 mm including wing.

Habitat, distribution, and phenology. *Joosia antioquiana* is known from wet forests at 500–925 m in northwestern Colombia, at least sometimes on sandstone substrates; it has been collected in flower in August and in fruit in March, April, November, and December.

IUCN Red List category. *Joosia antioquiana* meets the geographic range criterion for an evaluation of Endangered based on the limited known AOO, and

it is found outside legally protected areas in habitats that are in continuing decline. Thus it is here evaluated as Endangered due to limited distribution and habitat threat: EN B2ab(iii).

Discussion. This new species has previously been confused with *Joosia umbellifera*, and these species are similar. However *J. umbellifera* can be separated by its obtuse stipules; its laxer inflorescences, with the branched portion up to 8 × 12 cm; its usually five corolla lobes, with irregular marginal appendages 3–5 × 2.5–3.5 mm; and its notably larger seeds 7–11 mm long. Additionally, *J. umbellifera* can often be separated by its generally larger stipules, 9–28 mm long, and its leaves with eight to 18 pairs of secondary veins (Andersson, 1997a). The number of secondary leaf veins of *J. antioquiana* varies among the leaves along an individual stem, usually in correlation with leaf size, but on all the specimens seen at least some leaves have 21 or more pairs of secondary veins, more than found in *J. umbellifera*. Only one specimen seen of *J. antioquiana* has mature flowers and these are few and have not been dissected, thus the mature anthers and stigmas have not been seen and the floral biology is not determined. The silky pubescence of the abaxial leaf surface of *J. antioquiana* differs from the glabrous to puberulous abaxial leaf surface of *J. umbellifera* in Colombia. Similar leaf pubescence is found on some Peruvian plants that were provisionally included in *J. umbellifera* by Andersson (in herb., e.g., *Klug 2151*, MO), but the Peruvian plants differ from *J. antioquiana* in their larger laxer inflorescences and fewer secondary leaf veins. The rather dimorphic stipules, smaller and glabrous at the first nodes of lateral stems but larger and pubescent at other nodes, are apparently characteristic only of *J. antioquiana*.

The collections seen of *Joosia antioquiana* are all from an area of unusual sedimentary substrates that was studied floristically by researchers from Jardín Botánico Joaquín Antonio Uribe (JAUM) and Universidad de Antioquia, Medellín (HUA). Several other Rubiaceae species are also known only from there, e.g., *Coussarea antioquiana* C. M. Taylor and *Simira hirsuta* C. M. Taylor. The specific epithet refers to the geographic distribution of this new species.

Paratypes. COLOMBIA. **Antioquia:** mpio. San Francisco, carr. a Aquitania, quebrada La Alemania, nacimiento de quebrada La Cristalina, *D. Cárdenas L., G. Ramírez, A. Daza & J. Daza 2640* (JAUM, MO); mpio. San Luis, vereda el Portón, camino a la autopista Medellín–Bogotá, margen derecha del río Samaná, *D. Cárdenas L., J. G. Ramírez & J. Mejía 2510* (JAUM, MO); sector Río Samaná–Río Claro, camino hacia la vereda Tulipán, *A. Cogollo & A. Cruz Estrada 191* (JAUM, MO); vereda La Josefina, autopista Medellín–Bogotá, camino de caño la Mariola hacia Santa Bárbara, *S. Hoyos & J. Hernández 606* (JAUM, MO).

LADENBERGIA

This Neotropical genus of trees and shrubs is distinguished by its cymose terminal inflorescences, its salverform white corollas with five to seven valvate lobes, and its septicidal capsular fruits bearing numerous flattened seeds. *Ladenbergia* Klotzsch comprises about 35 species found in wet forests at low to upper elevations from southern Central America to southeastern Brazil (Andersson, 1997b). *Ladenbergia* was at one time separated from *Cinchona* L. based on capsule dehiscence, basipetal in *Ladenbergia* versus acropetal in *Cinchona*. However, Andersson concluded that capsule dehiscence is variable within both of these genera and even within some individual species, while these two genera are well separated by their flowers. In particular, the corollas are white with the lobes adaxially ridged and marginally entire to papillose on the nocturnal flowers of *Ladenbergia* versus pink-flushed to red with the lobes flat adaxially and villous to ciliate marginally on the diurnal flowers of *Cinchona*. *Remijia* DC. is similar to both of these genera in its flowers, fruits, and vegetative characters, but can be separated by its consistently axillary inflorescences.

Ladenbergia franciscana C. M. Taylor, sp. nov. TYPE: Ecuador. Zamora-Chinchipe: area of Estación Científica San Francisco, rd. Loja–Zamora, ca. 35 km from Loja, 3°58′S, 79°04′W, 2250 m, 16 Oct. 2004, *J. Homeier & I. Kottke 1406* (holotype, LOJA; isotypes, GOET, MO-5828678, QCNE). Figure 2A.

Haec species a *Ladenbergia brenesii* Standl. et *L. moritziana* Klotzsch folii apice obtuso usque subacuto, stipulis calyptratis, calyce non profunde lobato, ovario dense pubescente atque foliis constanter minoribus distinguitur.

Shrubs and small trees to 2.5 m tall; stems strigillose to glabrescent. *Leaves* opposite; blades elliptic, 5.5–10.5 × 2.1–4.7 cm, 2.1–2.7× as long as wide, drying stiffly subcoriaceous, glabrous adaxially, abaxially glabrous to minutely strigillose, base cuneate to obtuse, apex obtuse to subacute; secondary veins 6 to 9 pairs, adaxially plane to thickened, abaxially prominulous, with well-developed hirtellous domatia in axils; *petioles* 8–25 mm, strigillose to glabrescent; *stipules* caducous, calyptrate, 8–15 mm, densely strigillose, splitting along one side. *Inflorescences* cymose, unbranched or branched to one order, densely strigillose to tomentulose; peduncle 1.8–4 cm; branched portion pyramidal, 4.5–8 × 5–8 cm; bracts narrowly triangular, 3–5 mm; pedicels to 1.5 mm. *Flowers* subsessile to shortly pedicellate in groups of 3 to 5; ovary ellipsoid,

ca. 4 mm, densely pilosulose-tomentulose; *calyx* limb 3–4 mm, outside densely strigillose, inside glabrous, shallowly lobed, lobes ca. 1 mm, narrowly triangular, separated by concave sinuses; *corolla* white, salverform, fleshy, outside densely tomentulose-strigillose, inside glabrous and smooth; tube 23–33 mm, 3–4 mm diam. at base, ca. 5 mm diam. at throat; lobes 5, narrowly triangular, 12–18 mm, adaxially papillose along middle, acute; *anthers* ca. 7 mm, included, positioned just below corolla throat; *stigmas* not seen. *Capsules* subglobose, laterally somewhat compressed, 14–17 × 10–15 mm, with endocarp woody, ca. 0.5 mm thick; seeds not seen.

Habitat, distribution, and phenology. *Ladenbergia franciscana* is known from wet montane forests at 2200–2300 m in southern Ecuador; it has been collected in flower and fruit in October.

IUCN Red List category. *Ladenbergia franciscana* meets the geographic range criterion for Critically Endangered based on the very small AOO, and it is found close to but outside legally protected areas in habitats that are in continuing decline. The flora of this region is not well known, and this species might be found within the nearby protected area as well, and could also be distributed more widely in this region. Due to this lack of information it is here evaluated as Data Deficient: DD.

Discussion. This new species is known from southern Ecuador, an area of high species diversity for *Ladenbergia* (Andersson, 1997b); the specific epithet refers to the type locality, at the San Francisco research station. This new species is similar to *L. moritziana* Klotzsch of montane forests of northern Venezuela and to *L. brenesii* Standl. of montane forests of Costa Rica. These last two species can both be separated from *L. franciscana* by their leaves that are acute to markedly acuminate at the apex; their rounded to obtuse, glabrous, interpetiolar stipules 9–35 mm long; their calyx limbs that are deeply lobed for half or more of their length, with the lobes ligulate to broadly triangular; and their relatively slender capsules, 18–70 × 5–11 mm. As far as known, species of *Ladenbergia* are distylous (Andersson, 1997b), but the material available of *L. franciscana* is not adequate to determine its floral biology.

Paratypes. ECUADOR. **Zamora-Chinchipe:** area of Estación Científica San Francisco, ca. 30 km from Loja at rd. to Zamora, *D. Wolff 85* (MO), *158* (MO).

Pentagonia

The Neotropical genus *Pentagonia* Benth. comprises about 30 to 40 species of shrubs and small trees, mostly with very large leaves, found at low to montane elevations from Guatemala to Peru (Taylor, 2002; Andersson & Rova, 2004). *Pentagonia* is distinguished by its robust and sometimes rather fleshy habit; its well-developed interpetiolar stipules that are triangular and twisted in bud; its leaves with the secondary veins evident but the higher-order venation not visible, and the surfaces characteristically finely striate (Rova & Andersson, 1995); its axillary, capitate to cymose inflorescences; its relatively large fleshy flowers; its corollas with the tube well developed and five valvate lobes; and its rather leathery, berry-like fruits with numerous angled seeds. *Pentagonia* belongs to the small Neotropical tribe Hippotideae (Rova & Andersson, 1995) and is notable in the tribe and the family for its several species with deeply pinnatifid to rarely partially pinnate leaves (e.g., *P. tinajita* Seem.).

Pentagonia has not been studied as a whole, and its individual species are also mostly not well known. Many of the plants or species have an unbranched, monocaul (i.e., "pole") habit, which together with their unusually large leaves (up to 200 × 120 cm on petioles up to 30 cm long, e.g., *P. grandiflora* Standl.) makes the collecting of museum specimens difficult; extensive field observations are still needed to understand these plants. Andersson and Rova (2004) noted considerable morphological plasticity of the species they studied and adopted a rather broad species concept. Dwyer (1980) and Taylor (2002) considered habit and other characters less variable and used a narrower species concept. In particular, Andersson and Rova noted variation in habit, from unbranched to extensively branched within a species; they observed significant variation in the size of leaves and flowers on specimens, due primarily to differences in shrinkage during drying; and they considered pubescence characters to vary widely within a species. In contrast, others (e.g., Taylor, 2002; Cornejo, 2006) have considered the variation in these characters at least provisionally more limited within a species.

Pentagonia osaensis C. M. Taylor, sp. nov. TYPE: Costa Rica. Puntarenas: Reserva Forestal Golfo Dulce, Osa Peninsula, Rancho Quemado, at S end of valley, 8°40′S, 83°34′W, 160 m, 3 May 1988, *B. Hammel, R. Robles & J. Marín 16823* (holotype, CR; isotype, MO-3655725). Figure 1A, B.

Haec species a *Pentagonia macrophylla* Benth. bracteis reductis saepe caducis atque limbo calycino subtruncato vel usque ad tertiam partem lobato distinguitur.

Shrubs to 10 m tall, apparently branched; stems stout, markedly quadrangular, densely pilosulose,

tomentulose, and/or velutinous, to often glabrescent. *Leaves* opposite; blade broadly elliptic to elliptic-obovate, 35–58 × 26–30 cm, drying papery to chartaceous, adaxially glabrous, abaxially moderately to densely pilosulose or hirtellous, base rounded to truncate, apex broadly rounded to obtuse then abruptly acuminate with tip 0.5–2 cm; secondary veins 11 to 22 pairs; *petioles* 5–9 cm, densely pilosulose or tomentulose; *stipules* triangular to narrowly triangular, 2.5–3 cm, densely tomentulose or velutinous, acute. *Inflorescences* subcapitate to congested-cymose, subsessile, with 4 to 10 flowers, densely tomentulose or velutinous; bracts 0.5–2 mm, generally caducous; pedicels 0.5–3 mm. *Flowers* subsessile to shortly pedicellate; ovary slenderly ellipsoid, ca. 7 mm, moderately to densely pilosulose; *calyx* limb 6–12 mm, subtruncate to irregularly lobed for up to 1/3 its length, sparsely to densely pilosulose; *corolla* white, funnelform, outside densely velutinous-tomentulose, tube 20–40 mm, lobes triangular, 6–10 mm; *anthers* and *stigma* not seen. *Fruits* subglobose, 2–2.5 cm diam., gray, pilosulose to glabrescent, densely finely lenticellate; seeds angled, somewhat flattened, 3–5 mm.

Habitat, distribution, and phenology. *Pentagonia osaensis* is known from wet forests at 1–750 m in the Golfo Dulce, Osa Peninsula, and Puriscal regions of southern Costa Rica; it has been collected in flower in May and June, and in fruit in August.

IUCN Red List category. This species meets the geographic range criteria for Endangered based on the few known localities and small overall area, but fails to fulfill the required subcriteria for this evaluation. All but one of the known localities are within legally protected areas (according to the collection data), and additionally plants of *Pentagonia* are physically difficult to make into museum specimens and not always collected in botanical surveys, so this species is very possibly more common than the limited number of specimens suggests. *Pentagonia osaensis* is here evaluated as Least Concern (LC), although if these protected areas become ecologically threatened then this species could be considered Endangered.

Discussion. *Pentagonia osaensis* can be recognized within *Pentagonia* by the combination of its dense pilosulose to velutinous pubescence on the stems, stipules, undersides of the leaves, inflorescences, and calyx; its entire petiolate leaves; its truncate to shortly, irregularly lobed calyx limb; and its densely velutinous-tomentulose corolla. This species has incorrectly been called *P. sprucei* (in herb.); however, Andersson and Rova (2004) clarified that the type of *P. sprucei* Standl., from the Andes of Ecuador, is a synonym of *P. macrophylla* Benth. based on its well-developed inflorescence bracts, 5–15 mm long, and its calyx limb that is regularly lobed for half or more of its length with the lobes elliptic and imbricated. Consequently, these Costa Rican plants comprise a distinct species, undescribed until now; the specific epithet refers to the geographic distribution of this new species on the Osa Peninsula. Only two mature flowers are available on the specimens seen, and these were not dissected in order to preserve them; therefore, the internal corolla pubescence, anthers, and stigmas cannot be described here.

Paratypes. COSTA RICA. **Puntarenas:** cantón de Osa, Península de Osa, R.F. Golfo Dulce, Cerro de Oro, Albergue Unioro, *Angulo 458* (INB, MO); P.N. Corcovado, Arco de Piedras to Río Corcovado, *Kernan 1149* (CR, MO). **San José:** cantón de Puriscal, Cerros de Puriscal, Cerro Pelón, en la falda W, cuenca del Río Caliente, ca. del camino a Quepos, *Morales 3945* (INB, MO).

Posoqueria

This Neotropical genus of shrubs and small to medium-sized trees is distinguished by its cymose terminal inflorescences, its salverform white corollas with prolonged tubes and five imbricate lobes, and its relatively large indehiscent fruits with numerous flattened seeds embedded in juicy pulp. *Posoqueria* Aubl. comprises about 15 species found in moist to dry forests at low to montane elevations from Mexico to southeastern Brazil. Macias (1988) studied this genus with a focus on the Brazilian species. Species have been separated rather differently by the various authors who have studied this genus (e.g., Taylor et al., 2004). The relationships of *Posoqueria* were not all well known before molecular data provided new information and insights: recent studies have shown that it is more closely related to some other Neotropical genera that also often have weakly zygomorphic corollas, and *Posoqueria* has most recently been included with *Molopanthera* Turcz. in the Posoquerieae (Delprete et al., 2004), or these have both been included in the Henriquezieae (Robbrecht & Manen, 2006).

Posoqueria laevis C. M. Taylor, sp. nov. TYPE: Panama. Colón: Teck Cominco Petaquilla mining concession, 8°50′N, 80°41′W, 362 m, 4 Dec. 2007, *G. McPherson & H. van der Werff 19956* (holotype, PMA; isotype, MO-6173021). Figure 2C.

Haec species a ceteris speciebus *Posoqueriae* Aubl. centraliamericanis et Americae australis partium borealium foliis acutis sat parvis venatione utrinque non manifesta vel venis secundariis abaxialiter leviter evolutis distinguitur.

Trees to 10 m tall, glabrous nearly throughout; stems somewhat flattened. *Leaves* opposite; blades lanceolate to narrowly elliptic-oblong, 6.8–18 × 1.5–5 cm, drying stiffly papery, matte on both surfaces, base obtuse to rounded, apex acute; secondary veins not visible or 6 to 7 pairs and thinly prominulous abaxially on some but not all leaves of a stem, higher-order venation not visible; *petioles* 5–14 mm; *stipules* caducous, deciduous through fragmentation, or sometimes with basal parts persistent and becoming indurated, ovate to ligulate, 2–3 mm, sometimes puberulous, obtuse to rounded. *Inflorescences* fasciculate or shortly cymose, branched to one order, with 2 to 5 flowers; peduncle 3–6 mm; bracts reduced or foliaceous; pedicels 6–10 mm. *Flowers* pedicellate; ovary cylindrical, ca. 4 mm; *calyx* limb 1.5–2 mm, lobed for 1/3–1/2, lobes ligulate to triangular, obtuse to rounded, marginally hyaline and/or ciliolate; *corolla* white, salverform; tube 9.5–14 cm, ca. 2.5 mm diam.; lobes ligulate to oblanceolate, 2.3–2.8 cm, obtuse to rounded; *anthers* narrowly elliptic-oblong, ca. 6 mm, partially exserted, positioned in corolla throat, abaxially uniformly puberulous, at apex with triangular appendage ca. 1.2 mm, with filaments ca. 2 mm; stigmas not seen. *Fruit* ellipsoid, 8–9.5 × ca. 5 cm, smooth to lenticellate, with stipe to 20 mm; endocarp woody, 4–5 mm thick; seeds angled, 8–10 mm, smooth.

Habitat, distribution, and phenology. This species is known from wet forests at 220–323 m in central Panama; it has been collected in flower in September, November, and December, and in immature or perhaps mature fruit in February and December.

IUCN Red List category. This species meets the geographic range criteria for Critically Endangered based on the single known location and small overall range, which falls entirely outside of legally protected areas in a site and habitat that are potentially threatened by development. However, establishment of legal protection to preserve some of the natural vegetation of this site is underway, though it will still leave this species subject to stochastic events such as a hurricane or future degradation of the ecosystem. Therefore, this species is here evaluated as Vulnerable due to restricted range: VU D2.

Discussion. This new species is distinguished within *Posoqueria* by its average-sized fruits together with its relatively small leaves with unusual venation: the secondary and higher-order venation is not visible at all, or sometimes the secondary veins are evident on the abaxial leaf surface on some but not all leaves of a stem. The specific epithet refers to these leaves that are untextured by any evident venation. The pubescence of the stipules sometimes varies on an individual plant, which is unusual in Rubiaceae. The flowers of *P. laevis* resemble those of the plants that have been called *P. panamensis* (Walp. & Duchass.) Walp. (Steyermark, 1967; Burger & Taylor, 1993), but the plants included in *P. panamensis* differ in their broader leaves, with at least some leaves 8–17 cm wide, and their secondary leaf veins evident and usually prominent to prominulous on one or both leaf surfaces.

Posoqueria laevis appears to be endemic to central Panama. Several other Rubiaceae are also apparently restricted to this region, e.g., *Isertia scorpioides* B. M. Boom, *Hamelia sanguinea* T. S. Elias, *Psychotria insignis* Standl., and *P. sanblasensis* C. M. Taylor. However, some other Rubiaceae species suggested to be endemic to central Panama have subsequently been found to have a wider range, e.g., *P. fendleri* Standl., so this new *Posoqueria* species might be expected in northwestern South America as well.

Paratypes. PANAMA. **Colón:** Teck Cominco Petaquilla mining concession, *G. McPherson 19833* (MO, PMA), *G. McPherson & H. van der Werff 19861* (MO, PMA), *G. McPherson & M. Merello 20077* (MO, PMA), *M. Merello, J. I. González & R. Gómez 3094* (MO, PMA).

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Rubiacearum Americanarum Magna Hama Pars XXV: The Nocturnally Flowering *Psychotria domingensis–Coussarea hondensis* Group Plus Three Other Mesoamerican *Psychotria* Species Transfer to *Palicourea*

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Abstract. Several Neotropical shrubs and trees variously classified in *Psychotria* L. subg. *Heteropsychotria* Steyerm., *Palicourea* Aubl., and *Coussarea* Aubl. (Rubiaceae) share persistent stipules, apparently nocturnal flowers, well-developed white corollas with long tubes, and well-developed drupaceous fruits with two plano-convex pyrenes that generally have rather thin walls and are dorsally smooth or angled; additionally, most of these species have reduced stipules and relatively large fruits. The separation of *Psychotria* and *Coussarea* has been problematic at least in Central America, but removal here of six species from *Coussarea* leaves that genus characterized morphologically by 4-merous flowers and fruits with a single seed. Recent morphological and molecular surveys indicate that *Palicourea* and most species of *Psychotria* subg. *Heteropsychotria* comprise a single evolutionary group. These nocturnally flowering species all have the morphological features of *Palicourea* in this expanded circumscription and are here transferred to *Palicourea* along with three additional species from Mexico and Guatemala with relatively large, apparently hummingbird-pollinated flowers. Corresponding new combinations and names are published for several of these: *Palicourea alajuelensis* C. M. Taylor is based on *Coussarea austin-smithii* Standl.; *Palicourea beachiana* C. M. Taylor is based on *Coussarea nigrescens* C. M. Taylor & Hammel; *Palicourea breedlovei* (Lorence) Lorence is based on *Psychotria breedlovei* Lorence; *Palicourea calidicola* (C. M. Taylor) C. M. Taylor is based on *Psychotria calidicola* C. M. Taylor; *Palicourea chrysocalymma* (L. O. Williams) C. M. Taylor is based on *Psychotria chrysocalymma* L. O. Williams; *Palicourea diguana* (Standl. ex Steyerm.) C. M. Taylor is based on *Cephaelis diguana* Standl. ex Steyerm.; *Palicourea eurycarpa* (Standl.) C. M. Taylor is based on *Psychotria eurycarpa* Standl.; *Palicourea faxlucens* (Lorence & Dwyer) Lorence is based on *Psychotria faxlucens* Lorence & Dwyer; *Palicourea grandifructa* (C. M. Taylor) C. M. Taylor is based on *Coussarea grandifructa* C. M. Taylor; *Palicourea heydei* (Standl.) Lorence is based on *Psychotria heydei* Standl.; *Palicourea hondensis* (Standl.) C. M. Taylor is based on *Psychotria hondensis* Standl.; *Palicourea mediocris* (Standl. & Steyerm.) Lorence is based on *Coussarea mediocris* Standl. & Steyerm.; *Palicourea megalantha* (Lorence) Lorence is based on *Psychotria megalantha* Lorence; *Palicourea nebulosa* (Dwyer) C. M. Taylor is based on *Coussarea nebulosa* Dwyer; *Palicourea neopurpusii* C. M. Taylor is based on *Psychotria purpusii* Standl.; *Palicourea psychotrioides* (C. M. Taylor & Hammel) C. M. Taylor is based on *Coussarea psychotrioides* C. M. Taylor & Hammel; *Palicourea roseocremea* (Dwyer) C. M. Taylor is based on *Coussarea roseocremea* Dwyer; *Palicourea sousae* (Lorence & Dwyer) Lorence is based on *Psychotria sousae* Lorence & Dwyer; *Palicourea tetragona* (Donn. Sm.) C. M. Taylor & Lorence is based on *Cephaelis tetragona* Donn. Sm.; *Palicourea thornei* (Lorence) Lorence is based on *Psychotria thornei* Lorence; *Palicourea tutensis* (Dwyer) C. M. Taylor is based on *Psychotria tutensis* Dwyer; and *Palicourea umbelliformis* (Dwyer & M. V. Hayden) C. M. Taylor is based on *Psychotria umbelliformis* Dwyer & M. V. Hayden. The new species *Palicourea pereziana* C. M. Taylor is similar to these other nocturnally flowering species, and separated from *Palicourea roseocremea* by its

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smaller flowers and distribution in southern Costa Rica. Neotypes are designated for *Palicourea domingensis* (Jacq.) DC. (*Psychotria domingensis* Jacq.) and *Palicourea gardenioides* (Scheidw.) Hemsl. (*Rhodostoma gardenioides* Scheidw.).

RESUMEN. Varios arbustos y árboles neotropicales clasificados en *Psychotria* L. subg. *Heteropsychotria* Steyerm., *Palicourea* Aubl. y *Coussarea* Aubl. (Rubiaceae) comparten estípulas persistentes, flores aparentemente nocturnas, corolas blancas con el tubo bien desarrollado y frutos bien desarrollados con dos pirenos plano-convexos, que generalmente tienen paredes algo delgadas y son dorsalmente lisos o angulados; además la mayoría de estas especies tienen estípulas bastante reducidas y frutos relativamente grandes. La separación de *Psychotria* y *Coussarea* ha sido problemática por lo menos en América Central, pero la eliminación aquí de seis especies de *Coussarea* deja ese género consistentemente caracterizado morfológicamente por flores 4-meras y frutos con una sola semilla. Estudios morfológicos y moleculares recientes indican que *Palicourea* y la mayoría de las especies de *Psychotria* subg. *Heteropsychotria* constituyen un solo grupo evolutivo. Estas especies con floración nocturna tienen todas las características morfológicas de *Palicourea* en esta circunscripción ampliada, y se encuentran aquí tratadas en ese género además de tres especies adicionales procedentes de México y Guatemala con flores grandes aparentemente polinizadas por colibríes. Las correspondientes nuevas combinaciones y nombres se presentan para algunas: *Palicourea alajuelensis* C. M. Taylor se basa en *Coussarea austin-smithii* Standl.; *Palicourea beachiana* C. M. Taylor se basa en *Coussarea nigrescens* C. M. Taylor & Hammel; *Palicourea breedlovei* (Lorence) Lorence se basa en *Psychotria breedlovei* Lorence; *Palicourea calidicola* (C. M. Taylor) C. M. Taylor se basa en *Psychotria calidicola* C. M. Taylor; *Palicourea chrysocalymma* (L. O. Williams) C. M. Taylor se basa en *Psychotria chrysocalymma* L. O. Williams; *Palicourea diguana* (Standl. ex Steyerm.) C. M. Taylor se basa en *Cephaelis diguana* Standl. ex Steyerm.; *Palicourea eurycarpa* (Standl.) C. M. Taylor se basa en *Psychotria eurycarpa* Standl.; *Palicourea faxlucens* (Lorence & Dwyer) Lorence se basa en *Psychotria faxlucens* Lorence & Dwyer; *Palicourea grandifructa* (C. M. Taylor) C. M. Taylor se basa en *Coussarea grandifructa* C. M. Taylor; *Palicourea heydei* (Standl.) Lorence se basa en *Psychotria heydei* Standl.; *Palicourea hondensis* (Standl.) C. M. Taylor se basa en *Psychotria hondensis* Standl.; *Palicourea mediocris* (Standl. & Steyerm.) Lorence se basa en *Coussarea mediocris* Standl. & Steyerm.; *Palicourea megalantha* (Lorence) Lorence se basa en *Psychotria megalantha* Lorence; *Palicourea nebulosa* (Dwyer) C. M. Taylor se basa en *Coussarea nebulosa* Dwyer; *Palicourea neopurpusii* C. M. Taylor se basa en *Psychotria purpusii* Standl.; *Palicourea psychotrioides* (C. M. Taylor & Hammel) C. M. Taylor se basa en *Coussarea psychotrioides* C. M. Taylor & Hammel; *Palicourea roseocremea* (Dwyer) C. M. Taylor se basa en *Coussarea roseocremea* Dwyer; *Palicourea sousae* (Lorence & Dwyer) Lorence se basa en *Psychotria sousae* Lorence & Dwyer; *Palicourea tetragona* (Donn. Sm.) C. M. Taylor & Lorence se basa en *Cephaelis tetragona* Donn. Sm.; *Palicourea thornei* (Lorence) Lorence se basa en *Psychotria thornei* Lorence; *Palicourea tutensis* (Dwyer) C. M. Taylor se basa en *Psychotria tutensis* Dwyer; *Palicourea umbelliformis* (Dwyer & M. V. Hayden) C. M. Taylor se basa en *Psychotria umbelliformis* Dwyer & M. V. Hayden. La nueva especie *Palicourea pereziana* C. M. Taylor es similar a estas otras plantas con flores nocturnas, y se separa de *Palicourea roseocremea* por sus flores más pequeñas y distribución en el sur de Costa Rica. Neotipos se designan para *Palicourea domingensis* (Jacq.) DC. (*Psychotria domingensis* Jacq.) y *Palicourea gardenioides* (Scheidw.) Hemsl. (*Rhodostoma gardenioides* Scheidw.).

Key words: Antilles, Colombia, Costa Rica, *Coussarea*, Guatemala, IUCN Red List, Mexico, Nicaragua, *Palicourea*, Panama, *Psychotria*, Rubiaceae.

Palicourea Aubl. (Rubiaceae, tribe Psychotrieae) comprises several hundred Neotropical species of shrubs and small trees with persistent stipules, animal-pollinated flowers, and blue to purple-black, fleshy, drupaceous fruits (Taylor, 1996, 1997). These have been treated in two subgenera and nine sections (Taylor, 1997). Recent morphological (Taylor, 1996) and molecular (Andersson & Rova, 1999; Nepokroeff et al., 1999) studies indicate that the species currently classified in *Palicourea* plus many of the species of *Psychotria* L. subg. *Heteropsychotria* Steyerm., also Neotropical, comprise a single evolutionary group. This combined group takes the name *Palicourea* and is estimated to include about 600 Neotropical species. The study here begins the expansion of the circumscription of *Palicourea*, with the identification and transfer from *Psychotria* to *Palicourea* of two groups of species that are similar and apparently related to other plants currently included in *Palicourea*. *Cephaelis* Sw. was previously synonymized with *Psychotria* subg. *Heteropsychotria* (Steyermark, 1972) and now becomes a synonym of *Palicourea*.

The separation of *Palicourea* from *Psychotria* subg. *Heteropsychotria* has previously been based on corolla

characters related to presumed pollination mode (Steyermark, 1972; Taylor, 1996, 1997). In this taxonomy *Palicourea* has included plants adapted for hummingbird pollination: the flowers are odorless, pedicellate, and well separated from each other; the inflorescences and flowers are brightly colored; and the corollas are relatively large with well-developed, often curved tubes that are swollen at the base, with this basal portion containing appreciable quantities of nectar that are protected from insects by a ring of stiff trichomes. In contrast, *Psychotria* subg. *Heteropsychotria* has included insect-pollinated species, with the flowers sessile or subsessile, separated or variously grouped, and often fragrant; the inflorescence axes and corollas mostly green to white; and the corollas smaller, with straight bases and short tubes that allow easier access by insects to the nectar. However, in fact there is extensive variation in corolla form within both *Palicourea* and *Psychotria* subg. *Heteropsychotria*, more than has been noted in the genus descriptions, so these flower characters do not clearly separate two distinct groups of species. Otherwise, *Palicourea* and *Psychotria* subg. *Heteropsychotria* are not distinguishable vegetatively or in fruit. Combining them now creates a morphologically well-delimited group that has support from molecular data and includes extensive variation in corolla and inflorescence form. This situation is not unique in the Rubiaceae: recent molecular systematic analyses have demonstrated that both the inflorescence arrangement and the pollination mode with its corresponding adaptations have changed repeatedly in homoplasious fashion within several Rubiaceae genera (e.g., Nepokroeff et al., 1999; Malcomber & Taylor, 2009; Mouly et al., 2009), which indicates in turn that the corolla characters related to pollination sometimes do not provide a good basis for delimiting evolutionary groups in this family.

Palicourea in this new, broadened circumscription is recognized by its persistent bilobed stipules; its terminal, laxly thyrsiform to capitate, bracteate to ebracteate, green to brightly colored inflorescences; its generally 5-merous, sessile to pedicellate flowers; and its blue to purple-black succulent fruits (Taylor, 1996, 1997). In this broadened circumscription, the name *Psychotria* subg. *Heteropsychotria* becomes a synonym of *Palicourea*, but reclassification of its species is complicated because it was circumscribed based primarily on corolla characters that are widespread and apparently ancestral within its tribe, and thus included a heterogeneous assemblage of species. Several species have already been separated from *Psychotria* subg. *Heteropsychotria* into other genera (e.g., Taylor, 2004, 2005); the remaining species need individual evaluation as to their relationships. These relationships are indicated at least in part by fruit, stipule, and other vegetative features. The existing infrageneric classification of *Palicourea* incorporates some stipule and fruit characters (Taylor, 1997) and provides a framework for incorporation of additional species as well as additional characters such as details of leaf venation and of the pyrenes (Piesschaert, 2001). The two groups of species studied below can be classified in the existing infrageneric classification of *Palicourea*, and these are here transferred to this genus.

Group 1: The *Psychotria domingensis–Coussarea hondensis* Group

One species that has been particularly problematic to classify between *Palicourea* and *Psychotria* subg. *Heteropsychotria* is *Psychotria domingensis* Jacq. (Taylor, 1987). These shrubs from the Antilles, Mexico, and Central America have subsessile flowers with a sweet fragrance, and white or pink-flushed corollas with well-developed, often curved tubes. The flowers are apparently nocturnal and have been assumed to be pollinated by moths, and their characters do not fully agree with the traditional characterization of either *Palicourea* or *Psychotria* subg. *Heteropsychotria*. This species has been classified in *Psychotria* based on its insect-pollinated, subsessile flowers with the corollas glabrous internally and not swollen at the base (Taylor, 1987); or as *Palicourea domingensis* (Jacq.) DC. based on the relatively long, showy corollas with curved tubes (Adams, 1972). However, its persistent bilobed stipules and purple-black fruits show that this species belongs to *Palicourea* in the newer, broadened circumscription adopted here. Twelve other Mesoamerican species and one species from northwestern South America are similar to *Palicourea domingensis* in their stipules, their apparently nocturnal flowers, and the problems that they have presented with respect to their classification in *Palicourea*, *Psychotria* subg. *Heteropsychotria*, or *Coussarea* Aubl.; these species are all similarly included here in *Palicourea*.

Coussarea includes about a hundred species of shrubs and small trees with insect-pollinated flowers and fleshy fruits that contain thin-walled seeds or pyrenes (Taylor, 2001). The flowers of *Coussarea* are apparently nocturnal and characteristically have slender, bright white corollas with well-developed tubes. Most *Coussarea* species have entire, variously persistent or caducous stipules; 4-merous flowers; white or yellow fruits; and solitary seeds or pyrenes, except for six species from Mexico and Central

America that are morphologically unusual in the genus. These six species all have emarginate to shortly bilobed stipules, 5-merous flowers, and blue-black fruits with two plano-convex, thin-walled pyrenes. The most commonly collected of these six species is *C. hondensis* (Standl.) C. M. Taylor & W. C. Burger of Nicaragua, Costa Rica, and Panama, which was originally described provisionally in *Psychotria* based on its fruits, but then transferred to *Coussarea* based on its marked similarity to several species of that genus, in particular *C. austin-smithii* Standl. The same features of these six species that are anomalous in *Coussarea* are all characters of *Palicourea*, and it seems clear that these six were incorrectly included in *Coussarea*. Their removal leaves *Coussarea* well characterized morphologically, and in their new classification in *Palicourea* they can be seen to be similar and apparently closely related to *Palicourea domingensis*.

Within the existing classification of *Palicourea*, this group of nocturnally flowering species belongs to *Palicourea* subg. *Montanae* C. M. Taylor sect. *Psychotrioides* C. M. Taylor ser. 9 (Taylor, 1997: 235). The characterization of this section and series includes laminar stipules, broadly pyramidal to rounded inflorescences, white corollas with the slender tube elongating markedly just before anthesis, and pyrenes with broad angles or only weak longitudinal ridges. The Mesoamerican species studied here are morphologically similar to two Ecuadorian species of the above-mentioned *Palicourea* ser. 9, *P. andrei* Standl., and *P. candida* C. M. Taylor, which also have apparently nocturnal flowers (Taylor & Andersson, 1999). The nocturnally flowering species all have relatively large, slender, white corollas, generally 8–55 mm long; fruits that are in most cases relatively large, generally 8–20 mm long; pyrenes that are usually smooth or with only weak longitudinal ridges; and stipules that are emarginate to bilobed and laminar in form (i.e., with the intrapetiolar portions reduced; Taylor, 1997) or occasionally very reduced and apparently truncate. The one exception to this morphological characterization is *Psychotria umbelliformis* Dwyer & M. V. Hayden, which has stipules with a well-developed sheath and two well-developed linear lobes on each side; however, this species shares fruit and corolla morphology with these others, and is provisionally included here based on those other characters. Another species from northwestern Colombia, *Psychotria diguana* (Standl. ex Steyerm.) C. M. Taylor, also has the characters of this group and is transferred to *Palicourea* here. A key to all of the nocturnally flowering species of this series is presented below and serves to outline the characters for recognizing these species.

Group 2: Three Additional Mesoamerican Species Transfer to *Palicourea*

Three species of shrubs and small trees from southern Mexico and Guatemala have been classified in *Psychotria* subg. *Heteropsychotria* based on their corollas that are white to yellow, straight at the base, and glabrous inside: *Psychotria chrysocalymma* L. O. Williams, *P. heydei* Standl., and *P. purpusii* Standl. However, these three species have relatively large, tubular or tubular-funnelform corollas with well-developed tubes, showy inflorescences, and rather large fruits, and additionally are very similar in general aspect and stipule morphology to *Palicourea padifolia* (Roem. & Schult.) C. M. Taylor & Lorence and *Palicourea leucantha* Donn. Sm. of *Palicourea* subg. *Montanae* sect. *Montanae* ser. 3, subser. c (Taylor, 1997: 232). These three species of *Psychotria* differ from the *Palicourea* species currently classified in that subseries only in their flowers that are all sessile or mixed sessile and pedicellate, versus all the flowers pedicellate in the species already included in *Palicourea*. As discussed above, inflorescence arrangement is not by itself a good indicator of evolutionary groups in *Palicourea* and *Psychotria*, and accordingly these three species are here transferred to *Palicourea* where they are classified in the aforementioned subseries.

Taxonomy and Conservation Assessment

Taxonomy. Additional information including high-resolution scans of representative specimens of most of these species is available at <http://www.tropicos.org>; high-resolution scans of type specimens deposited at several other institutions are available on the corresponding web sites. The species treated here are arranged in alphabetical order and numbered accordingly. The numbered species in the key below are also discussed in the following nomenclatural section. Previously published synonymy is not summarized here for the species treated; this synonymy can be found in Lorence (1999), Burger and Taylor (1993), and Taylor and Andersson (1999).

Conservation status assessment methodology. The study presented here is taxonomic and floristic: the objective is enumeration of the species that belong to various Rubiaceae genera, and the species that occur in the area of tropical Central and South America. The methods employed here correspond only to this objective; thus this study is based on survey of specimens collected over a number of years using varied survey methods aimed at various objectives. The specimens here used to delineate the range and

commonness of these new species were located through a non-exhaustive survey of several herbaria, and no field studies have been done targeting the occurrence of these species where they are known or expected to grow. Thus the floristic information presented here is a simplified presence report based on incomplete survey of the available data, which are uneven and incomplete for this region (Schulman et al., 2007). Knowledge of the true geographic range and the population size and dynamics of a species are essential to understanding the threats to its existence, and thus to understanding its actual conservation status; documentation of the existence of a species based on one or several museum collections generally does not provide adequate data to evaluate these factors. A conservation assessment is provided here for this newly described species using IUCN categories and criteria (IUCN, 2001) based on the totality of our current knowledge. The basis for this assessment in the form of a map and the calculated assessment parameters is available under the corresponding species name at <http://www.tropicos.org> (assessment parameters can be seen using "Show Detail"). The assessment parameters were calculated using the IUCN Rating tool (Moat, 2007) in ArcView GIS 3.2 (ESRI, 1999), with the grid cell size used for calculating Area of Occupancy (AOO) varied between 1.00 and 3.16 km depending on characteristics of the species and data (IUCN Standards and Petitions Working Group, 2008). This assessment is not being submitted to the IUCN for publication in the Red List (<http://www.iucnredlist.org>), and the basis for this assessment should be carefully evaluated by the reader.

KEY TO NOCTURNALLY FLOWERING SPECIES OF *PALICOUREA* SER. 9

1. Calyx limb 3–6 mm long, subtruncate to lobed.
   2. Stipules 12–18 mm long . . . . . *P. candida*
   2′. Stipules 1–5 mm long.
      3. Inflorescence congested-cymose to capitate, with bracts well developed and enclosing the ovaries of the flowers, those subtending flowers 3–10 mm long.
         4. Corolla tube 16–17 mm long; stipules on each side with unlobed basal portion ca. 1 mm long and 2 narrowly triangular lobes, these 2–3 mm long and longer than the unlobed basal portion . . . 23. *P. thornei*
         4′. Corolla tube 20–40 mm long; stipules 2–5 mm long, on each side lobed for less than half (i.e., the basal unlobed portion longer than the lobes).
            5. Corolla with the tube 20–25 mm long and the lobes 5–5.5 mm long; fruits 5–7 mm long; Mexico . . . . . 10. *P. gardenioides*
            5′. Corolla with the tube 20–40 mm long and the lobes 6.5–15 mm long; fruits 8–16 mm long; Mexico to Colombia.
               6. Fruits 8–10 × 8–10 mm, the pyrenes dorsally (i.e., abaxially) with 3 to 4 ridges of similar size, with the margins not thickened or similar in development to ridges; western Colombia . . . . . 6. *P. diguana*
               6′. Fruits 12–16 × 9–13 mm, the pyrenes with one very well-developed dorsal ridge and the margins markedly thickened; Mexico to Panama. . . . . 22. *P. tetragona*
      3′. Inflorescence capitate to laxly cymose, with bracts lacking, reduced, or few, 0.5–4 mm long, not or only partially covering the ovaries of the flowers.
         7. Corolla with the lobes 5–5.5 mm long; fruits 6–7 × 6–7 mm, the pyrenes dorsally (i.e., abaxially) ridged . . . . . 10. *P. gardenioides*
         7′. Corolla with the lobes 8–13 mm long; fruits 9–14 × 7–10 mm, the pyrenes dorsally smooth to ridged.
            8. Inflorescence capitate, with a single group of flowers and the peduncle thickened at top; corolla externally glabrous; fruits 12–14 × 8–10 mm . . . . . 9. *P. faxlucens*
            8′. Inflorescence cymose, branched to 1 to 2 orders, with peduncle not thickened at top; corolla externally densely puberulous; fruits 9–11 × 7–9 mm . . . . . 15. *P. megalantha*
1′. Calyx limb 0.2–2.9 mm long, truncate to lobed.
   9. Stipules united around the stem into a truncate sheath, on each side with 2 linear lobes 3–12 mm long. . . . . 25. *P. umbelliformis*
   9′. Stipules shortly united around the stem to laminar (i.e., with the intrapetiolar portions reduced, the 2 remaining interpetiolar portions nearly separated), truncate, broadly rounded, or triangular, entire to emarginate, 2-dentate, or 2-lobed, the lobes rounded to triangular, < 3 mm long.
      10. Inflorescences capitate, sometimes later becoming cymose, the bracts well developed and covering the ovaries of the flowers, the bracts subtending the flowers 8–11 mm long . . . . . 6. *P. diguana*
      10′. Inflorescences congested to laxly cymose, the bracts reduced or when present not covering the ovaries of the flowers, the bracts subtending the flowers 0.1–4 mm long.
         11. Stipules 8–15 mm long.
            12. Corolla with the tube 20–25 mm long and the lobes 6–8 mm long; pyrenes dorsally (i.e., abaxially) ridged . . . . . *P. andrei*
            12′. Corolla with the tube 9–18 mm long and the lobes 7.5–16 mm long; pyrenes dorsally smooth.
               13. Stipules 4–8 mm long; corolla tube 9–14 mm long; mature fruits 10–12 mm diam. . . . . 1. *P. alajuelensis*

13′. Stipules 8–15 mm long; corolla tube 16–18 mm long; mature fruits 15–17 mm diam. . . . . 13. *P. hondensis*

11′. Stipules 0.5–7.9 mm long.

14. Flowers sessile or subsessile in glomerules of 2 to 7, the glomerules produced at the ends of the inflorescence axes.

15. Calyx limb 1.2–2.2 mm long.

16. Stipules with the lobes 1–2 mm long; corolla with the lobes 6–8 mm long; fruits 4–7 × 6–8 mm. . . . . 7. *P. domingensis*

16′. Stipules with the lobes 0.2–0.5 mm long; corolla with the lobes 4.5–5.5 mm long; fruits 9–10 × 6–8 mm . . . . . 21. *P. sousae*

15′. Calyx limb 0.3–1 mm long.

17. Stipules 3.5–4 mm long . . . . . 3. *P. breedlovei*

17′. Stipules 0.5–2.5 mm long.

18. Stipules truncate to broadly rounded, 0.5–1 mm long. . . . . 19. *P. psychotrioides*

18′. Stipules rounded to broadly triangular and emarginate, 2-dentate, or 2-lobed, 1–2.5 mm long.

19. Plants drying dark gray or blackened; corolla with tube 22–25 mm long; pyrenes dorsally smooth to broadly angled . . . . . 2. *P. beachiana*

19′. Plants drying green or grayish green; corolla with tube 6–14 mm long; pyrenes dorsally broadly angled to weakly ridged.

20. Corolla with the tube ca. 7 mm long and the lobes ca. 3 mm long; leaves not shiny below (i.e., abaxially). . . . . 18. *P. pereziana*

20′. Corolla with the tube 12–14 mm long and the lobes 8–11 mm long; leaves shiny below . . . . . 20. *P. roseocremea*

14′. Flowers sessile to shortly pedicellate in dichotomous cymules, the flowers mostly separated from each other, borne singly and/or in pairs along as well as at the ends of the axes.

21. Stipules triangular, 4–8 mm long . . . . . 1. *P. alajuelensis*

21′. Stipules truncate to broadly triangular, 0.5–3.2 mm long.

22. Calyx limb 1.2–3 mm long. . . . . 7. *P. domingensis*

22′. Calyx limb 0.2–1 mm long.

23. Stipules 0.8–1 mm long, truncate to broadly rounded. . . . . 11. *P. grandifructa*

23′. Stipules 0.5–3 mm long, broadly triangular and emarginate, 2-dentate, or 2-lobed.

24. Corolla with tube 18–23 mm long; Mexico, Guatemala, Costa Rica, and Panama.

25. Stipules emarginate to shortly bilobed, the lobes broadly triangular; inflorescence with bracts lacking or few and scattered; corolla with tube 10–17 mm long; Mexico, Guatemala. . . . . 14. *P. mediocris*

25′. Stipules 2-lobed with the lobes narrowly triangular; inflorescence with the bracts small but regularly developed; corolla with tube 18–20 mm long; Costa Rica, Panama. . . . . 16. *P. nebulosa*

24′. Corolla with tube 9–14 mm long; Nicaragua, Costa Rica, and Panama.

26. Corolla with tube ca. 9 mm long; Panama . . . . . 24. *P. tutensis*

26′. Corolla with tube 10–14 mm long; Nicaragua, Costa Rica.

27. Corolla with tube 13–14 mm long; fruits 15–20 mm long; 0–800 m . . . . . 4. *P. calidicola*

27′. Corolla with tube 11–12 mm long; fruits 8–12 mm long; 700–1500 m . . . . . 8. *P. eurycarpa*

1. Palicourea alajuelensis C. M. Taylor, nom. nov. Replaced name: *Coussarea austin-smithii* Standl., Publ. Field Mus. Nat. Hist., Bot. Ser. 18: 1286. 1938, not *Palicourea austin-smithii* Standl., 1938. TYPE: Costa Rica. Alajuela: region of Zarcero, 4700 ft., 25 Aug. 1937, *A. Smith 4226* (holotype, F-905233).

This species is known from northern Costa Rica at 600–1600 m. The new name refers to the area where the type was collected, the province of Alajuela. The name *Palicourea austin-smithii* Standl. is a synonym of *P. salicifolia* Standl. (Taylor, 1989), which can be recognized by its shorter funnelform corollas, its smaller fruits, and its distribution at 2000–3100 m from central Costa Rica through western Panama (Burger & Taylor, 1993).

2. Palicourea beachiana C. M. Taylor, nom. nov. Replaced name: *Coussarea nigrescens* C. M. Taylor & Hammel, Selbyana 12: 135, fig. 1. 1991, not *Palicourea nigrescens* M. Martens & Galeotti, 1844. TYPE: Costa Rica. Heredia: Finca La Selva, OTS field station near Puerto Viejo de Sarapiquí, near jct. of Ríos Puerto Viejo & Sarapiquí, 100 m, 5 Nov. 1980, *B. Hammel 10383* (holotype, DUKE).

This species is known from Nicaragua and Costa Rica at 0–850 m. This new name honors James H.

Beach, who studied breeding biology of several Rubiaceae species at the La Selva Biological Station in northeastern Costa Rica (Bawa & Beach, 1983). The name *Palicourea nigrescens* M. Martens & Galeotti is a synonym of *Psychotria mexiae* Standl., which can be recognized by its caducous stipules that are fused into a conical cap, its tiny corollas, and its red fruits (Hamilton, 1989).

3. **Palicourea breedlovei** (Lorence) Lorence, comb. nov. Basionym: *Psychotria breedlovei* Lorence, Novon 4: 125, fig. 4. 1994. TYPE: Mexico. Chiapas: mpio. La Trinitaria, a 1 km al E de Tzisca o a 11 km al E de la entrada al Parque Nac. Lagos de Montebello, 16°05′N, 91°39′W, 1330 m, 9 Aug. 1985, *T. Chehaibar 170* (holotype, PTBG-9595; isotypes, MEXU, UAMIZ).

This species is known from southern Mexico (Chiapas) and Guatemala at 1300–1400 m.

4. **Palicourea calidicola** (C. M. Taylor) C. M. Taylor, comb. nov. Basionym: *Psychotria calidicola* C. M. Taylor, Novon 14: 497, fig. 2A–D. 2004. TYPE: Costa Rica. Limón: Parque Nac. Tortuguero, sobre el Río Tortuguero, ca. 3 km al SO del pueblo, 4 m, 12 Oct. 1988, *R. Robles 2100* (holotype, CR; isotype, MO-03644674).

This species is known from Nicaragua to Panama at 0–800 m.

5. **Palicourea chrysocalymma** (L. O. Williams) C. M. Taylor, comb. nov. Basionym: *Psychotria chrysocalymma* L. O. Williams, Phytologia 28(3): 228. 1974. TYPE: Guatemala. El Progreso: hills N of Finca Piamonte, betw. Finca Piamonte & summit of Volcán Santa Luisa, 2400–3333 m, 5 Feb. 1942, *J. A. Steyermark 43518* (holotype, F-1133849).

This species is known from Guatemala at 2400–3333 m.

6. **Palicourea diguana** (Standl. ex Steyerm.) C. M. Taylor, comb. nov. Basionym: *Cephaelis diguana* Standl. ex Steyerm., Acta Biol. Venez. 4: 14. 1964. *Psychotria diguana* (Standl. ex Steyerm.) C. M. Taylor, Novon 6(2): 212. 1996. TYPE: Colombia. Valle del Cauca: Cordillera Occidental, vertiente occidental, hoya del Río Digua, quebrada del Río San Juan, arriba de Queremal, Las Colonias, 1950–2050 m, 20 Mar. 1947, *J. Cuatrecasas 23960* (holotype, US-2825317; isotypes, F-1285352, VEN not seen).

This species is known from western Colombia at 0–2500 m.

7. **Palicourea domingensis** (Jacq.) DC., Prodr. 4: 529. 1830. Basionym: *Psychotria domingensis* Jacq., Enum. Syst. Pl. 16. 1760. TYPE: Dominican Republic. Barahona: Arroyo San Rafael, arriba de la carr. de Barahona a Oviedo en el poblado de San Rafael, 5 km desde Paraíso en la carr. a Barahona, 18°02′N, 71°08′W, 20 m, 15 June 1982, *T. Zanoni, M. Mejía & J. Pimentel 20943* (neotype, designated here, JBSD; duplicates, MO-4279412, NY).

This species is known from central Mexico to Costa Rica, in coastal northern South America, and widely throughout the Antilles at 0–800 m; it was studied by Taylor (1987), who presented a morphological description and synonymy. The original description of this species was based on plants from Santo Domingo, probably meaning the country now called the Dominican Republic rather than the modern city. However, very few Neotropical specimens corresponding to Jacquin's names have been located (D'Arcy, 1970), and apparently none has been found for this species.

8. **Palicourea eurycarpa** (Standl.) C. M. Taylor, comb. nov. Basionym: *Psychotria eurycarpa* Standl., J. Wash. Acad. Sci. 18: 275. 1928. TYPE: Costa Rica. Guanacaste: Quebrada Serena, SE of Tilarán, 700 m, 27 Jan. 1926, *P. C. Standley & J. Valerio 46237* (holotype, US-1254544).

This species is known from Costa Rica and Panama at 700–1500 m.

9. **Palicourea faxlucens** (Lorence & Dwyer) Lorence, comb. nov. Basionym: *Psychotria faxlucens* Lorence & Dwyer, Bol. Soc. Bot. México 47: 50, fig. 1. 1987. TYPE: Mexico. Veracruz: mpio. Catemaco, Ejido de Coscoapán, 8 km SE de Coyame, 16 Apr. 1974, *F. Ponce & R. Cedillo T. 2* (holotype, MEXU; isotypes, F-1890407, MO-2887095).

This species is known from central Mexico (Veracruz) at 150–950 m (Lorence & Dwyer, 1987).

10. **Palicourea gardenioides** (Scheidw.) Hemsl., Biol. Cent.-Amer., Bot. 2(7): 52. 1881. Basionym:

Rhodostoma gardenioides Scheidw., Allg. Gartenzeitung 10: 286. 1842. *Psychotria gardenioides* (Scheidw.) Standl., J. Wash. Acad. Sci. 17(13): 342. 1927. TYPE: Mexico. Veracruz: Catemaco, 500 m, 20 May 1968, *G. Martínez C. 1700* (neotype, designated here, XAL; duplicate, MO-2703387).

This species is known from eastern Mexico (Tamaulipas to Campeche) at 0–700 m. The original description of *Rhodostoma gardenioides* was based on cultivated material of unknown origin from a locality designated only as Veracruz, Mexico, with no specimen mentioned or designated. A neotype from Veracruz State, Mexico, is here designated.

11. Palicourea grandifructa (C. M. Taylor) C. M. Taylor, comb. nov. Basionym: *Coussarea grandifructa* C. M. Taylor, Novon 11: 138, fig. 2A, B. 2001. TYPE: Costa Rica. Puntarenas: Reserva Forestal Golfo Dulce, Osa Peninsula, Rancho Quemado, ca. 15 km W of Rincón, in bottom of valley along Río Riyito near bridge & in forest along rd. on ridge above valley, 8°42′N, 83°33′W, 250 m, 31 May 1988, *B. Hammel, G. Herrera, M. M. Chavarría & A. Solís 16950* (holotype, MO-3846254).

This species is known from southern Costa Rica at 130–400 m.

12. Palicourea heydei (Standl.) Lorence, comb. nov. Basionym: *Psychotria heydei* Standl., J. Wash. Acad. Sci. 18: 184. 1928. TYPE: Guatemala. Quiché: Chiúl, 2600 m, Apr. 1892, *E. T. Heyde & E. Lux 3173* (holotype, US-939642; isotype, F-578982).

This species is known from southern Mexico (Chiapas) and Guatemala at 2300–2800 m.

13. Palicourea hondensis (Standl.) C. M. Taylor, comb. nov. Basionym: *Psychotria hondensis* Standl., J. Wash. Acad. Sci. 18: 183. 1928. *Coussarea hondensis* (Standl.) C. M. Taylor & W. C. Burger, Selbyana 12: 138. 1991. TYPE: Costa Rica. Limón: Bois de Río Hondo, versant atlantique, 100 m, Aug. 1901, *H. Pittier 16161* (holotype, US-764151).

This species is known from Nicaragua to Panama at 0–1100 m, and is frequently encountered in Costa Rica and eastern Nicaragua.

14. Palicourea mediocris (Standl. & Steyerm.) Lorence, comb. nov. Basionym: *Coussarea mediocris* Standl. & Steyerm., Publ. Field Mus. Nat. Hist., Bot. Ser. 23: 248. 1947. TYPE: Guatemala. Huehuetenango: Sierra de los Cuchumatanes, vic. of Maxbal, ca. 17 mi. N of Barillas, 1500 m, 15–26 July 1942, *J. A. Steyermark 48732* (holotype, F-1134264; isotype, US-01920019).

Coussarea izabalensis C. M. Taylor, Novon 11(1): 140, fig. 2D, E. 2001, syn. nov. TYPE: Guatemala. Izabal: El Estor, 17 Mar. 1972, *E. Contreras 11354* (holotype, MO-4332300).

This species is known from Guatemala at 0–1500 m. *Coussarea izabalensis* was distinguished from *C. mediocris* based only on its significantly larger corollas. However, the measurements given in the protologue of *C. mediocris* are inaccurate, because the length was given in centimeters but should be in millimeters. Thus these species cannot be separated by corolla size and are here synonymized.

15. Palicourea megalantha (Lorence) Lorence, comb. nov. Basionym: *Psychotria megalantha* Lorence, Bol. Soc. Bot. México 47: 58, fig. 2c, d. 1987. TYPE: Mexico. Oaxaca: Ixtlán, Sierra de Juárez, Ruta 175 Tuxtepec a Oaxaca, 5 km NE de Vista Hermosa, 1300 m, 28 May 1983, *D. Lorence & R. Cedillo T. 4190* (holotype, MEXU; isotypes, BM, BR, CAS, ENCB, F-2032477, K, MEXU, MO-3772888, NY, UC, US-03330470, W, WIS, TEX, XAL).

This species is known from southern Mexico (Oaxaca) at 800–1800 m (Lorence & Dwyer, 1987).

16. Palicourea nebulosa (Dwyer) C. M. Taylor, comb. nov. Basionym: *Coussarea nebulosa* Dwyer, Ann. Missouri Bot. Gard. 67: 131. 1980. *Psychotria nebulosa* (Dwyer) C. M. Taylor, Novon 5: 205. 1995, hom. illeg., not *Psychotria nebulosa* K. Krause, 1920. TYPE: Panama. Chiriquí: uncut cloud forest at Monte Rey near Boquete, 20 July 1971, *T. B. Croat 15868* (holotype, MO-2162995; isotype, MO-4043128).

This species is known from Costa Rica and Panama at 400–1600 m.

17. Palicourea neopurpusii C. M. Taylor, nom. nov. Replaced name: *Psychotria purpusii* Standl., Contr. U.S. Natl. Herb. 23(5): 1388. 1926, not *Palicourea purpusii* Standl., 1930. TYPE: Mexico. Chiapas: Cerro del Boquerón, Aug. 1913, *C. A. Purpus 7012* (holotype, US-567269; isotypes, F-415780, GH, MO-741513).

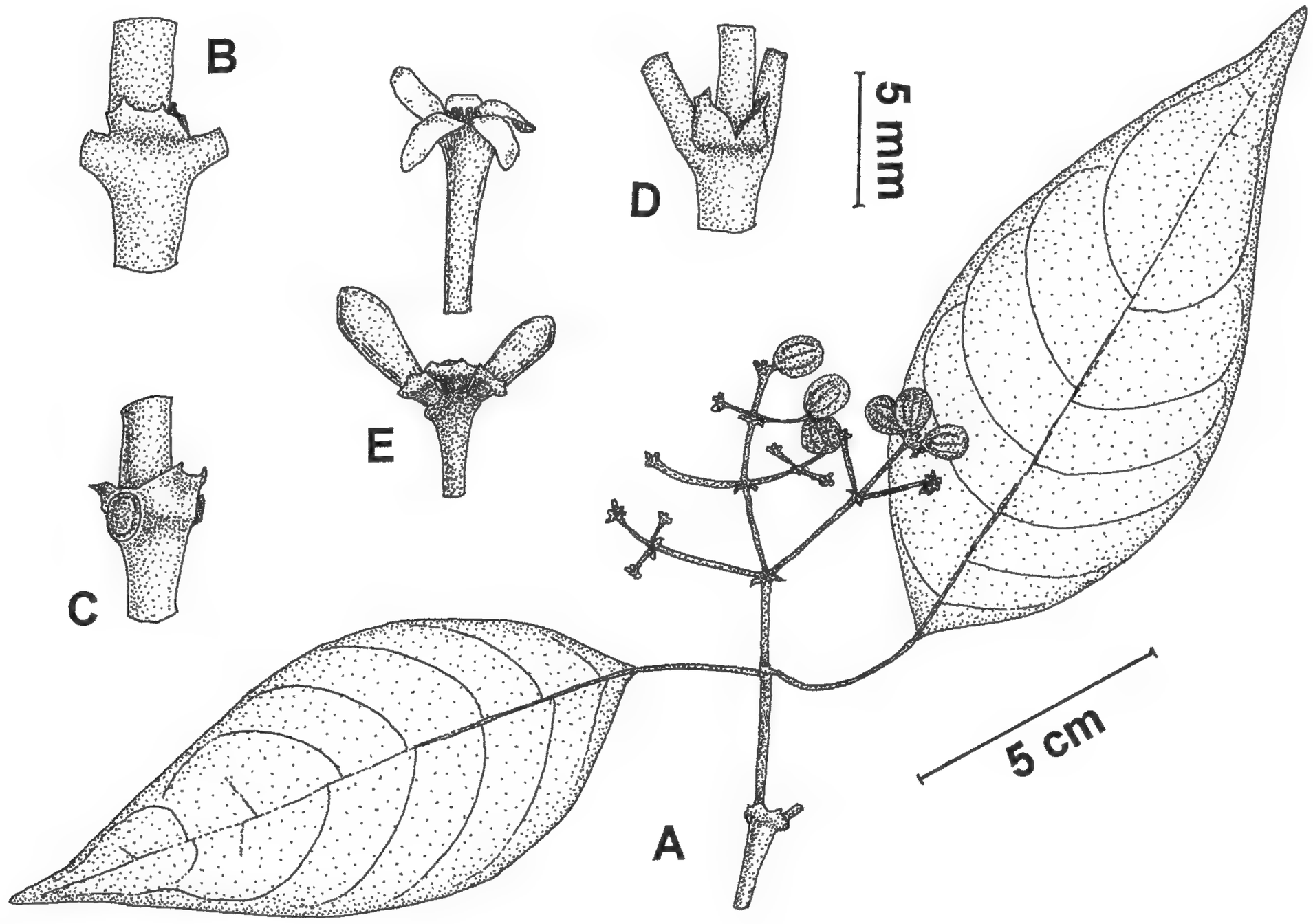

Figure 1. *Palicourea pereziana* C. M. Taylor. —A. Portion of fruiting branch, based on the paratype *Navarro 266* (MO). —B. Portion of stem with stipule, with view of interpetiolar portion, based on the paratype *Alfaro 3927* (MO). —C. Portion of stem with stipule, with three-quarter view of intrapetiolar portion, based on the type *Kriebel 103* (MO). —D. Portion of stem with stipule, with view of interpetiolar portion showing characteristic longitudinal splitting, based on the paratype *Gómez et al. 21973* (MO). —E. Portion of inflorescence, with two flower buds and one flower at anthesis and partially dissected; based on the type *Kriebel 103* (MO). B–E to same 5-mm scale.

This species is known from southern Mexico (Chiapas) and Guatemala at 1800–2700 m. The name *Palicourea purpusii* Standl. is a synonym of *P. macrantha* Loes., which is found in the same region as *P. neopurpusii* (Taylor, 1989); *P. macrantha* can be recognized by its flowers all borne on well-developed pedicels (6–20 mm long) versus the flowers all sessile in *P. neopurpusii*.

18. Palicourea pereziana C. M. Taylor, sp. nov. TYPE: Costa Rica. Puntarenas: Coto Brus, cuenca Térraba-Sierpe, Hacienda La Amistad, 8°55′N, 82°48′W, 1242 m, 17 Mar. 2002, *R. Kriebel 103* (holotype, INB; isotype, MO-04858622). Figure 1.

Haec species a *Palicourea roseocremea* (Dwyer) C. M. Taylor floribus minoribus distinguitur.

Shrubs and small trees flowering at 5 m tall, to 8 m tall; stems glabrous. *Leaves* with blades ovate to elliptic, 9.5–22 × 3–10 cm, glabrous, base obtuse to rounded, apex acuminate with tips 1–1.5 cm, drying thinly papery and matte on both surfaces; secondary veins 6 to 12 pairs, usually looping to interconnect at least in distal part of blade, without or with 1 to 2 weak intersecondary veins present between pairs of secondary veins; *petioles* 1.5–2.5 cm, glabrous; *stipules* shortly united around stem or laminar (i.e., with intrapetiolar portion reduced), glabrous, broadly triangular to oblong, 2-lobed, basal unlobed portion 1–2 mm, truncate to concave between lobes, lobes narrowly triangular, 0.2–0.5 mm, acute, older stipules sometimes developing a longitudinal split on each interpetiolar side. *Inflorescence* terminal, cymose, apparently green; peduncle 1–4.5 cm, glabrous; branched portion pyramidal, 2–4.5 × 2–6 cm, branched to 2 orders, axes puberulous to glabrescent; bracts triangular to ovate, 1–3 mm, those subtending flowers or groups of flowers 1–1.5 mm. *Flowers* sessile in glomerules of 3 to 7 at ends of secondary and tertiary inflorescence axes; hypanthium turbinate, ca. 0.5 mm, puberulous to glabrous; *calyx* limb 0.8–1 mm, cupuliform, glabrous, sinuate to denticulate; *corolla* salverform, white, externally densely puberulous, tube ca. 7 mm, lobes ligulate, ca. 3 mm, abaxially smooth; anthers and stigmas not seen. *Fruits* ellipsoid to obovoid, 8–10 mm diam., not flattened, purple, glabrous; *pyrenes* 2, plano-convex, dorsally (i.e., abaxially) broadly angled or with low obtuse ridges, rather thin-walled.

Habitat, distribution, and phenology. This species is known from wet forests in southern Costa Rica, on Pacific slopes of the Cordillera de Talamanca in the upper Río Térraba basin at 1140–1500 m; it has been collected in flower in March and April, and in fruit in March.

IUCN Red List category. This species meets the geographic range criteria for Critically Endangered based on its very restricted distribution. Despite the very small Extent of Occurrence (EOO), the population cannot necessarily be considered severely fragmented. Because of the complex topography, with collection points in two separate river drainages and thus potentially not subject to the same threatening events, the number of locations should be considered at least two; thus subcriterion (a) is fulfilled for an evaluation of Endangered, but not Critically Endangered. However, the region's native vegetation is presumed to be in continued decline due to habitat destruction. The evaluation of this species is thus modified based on these other considerations, so that this species is here evaluated as Endangered due to limited range and habitat decline: EN B1ab(iii)+2ab(iii).

Discussion. This new species can be recognized by the combination of its reduced bidentate stipules, well-developed leaves with the secondary veins usually looping to interconnect in the distal portion of the blade, pyramidal inflorescences branched to two orders with the flowers all grouped in glomerules at the end of each axis, white salverform corollas, and somewhat large and rounded fruits with the pyrenes generally broadly angled on the back. The corollas seen are either still in bud or not well preserved, thus their condition is inadequate for dissection. This new species is named in honor of Costa Rican botanist Isabel Pérez, whose energetic work has advanced curation of the INB herbarium and the preparation of the *Manual de Plantas de Costa Rica*, and who happily passed part of her childhood living along the Río Térraba.

This new species is similar to and has been confused with *Palicourea roseocremea* (Dwyer) C. M. Taylor, which is also studied in this article. However, *P. roseocremea* can be separated by its larger corollas, with the tube 12–14 mm long and the lobes almost as long as the tube, 8–11 mm long, as well as its dry leaf blades that are shiny on the abaxial surface, versus not at all shiny abaxially in *P. pereziana*. The separation here of the Costa Rican plants into *P. pereziana* makes these two species now allopatric.

Paratypes. COSTA RICA. **Puntarenas:** La Tigra–Las Mellizas, *L. D. Gómez, R. Chacón, I. Chacón & G. Herrera 21973* (CR, MO); cantón de Coto Brus, cuenca Térraba–Sierpe, camino a Finca Neblina, *E. Alfaro 3927* (INB, MO); Valle del General, Finca Cafrosa, *E. Navarrro 266* (CR, MO).

19. Palicourea psychotrioides (C. M. Taylor & Hammel) C. M. Taylor, comb. nov. Basionym: *Coussarea psychotrioides* C. M. Taylor & Hammel, Selbyana 12: 135, fig. 2. 1991. TYPE: Costa Rica. Heredia: Finca La Selva, OTS field station near Puerto Viejo de Sarapiquí, near jct. of Ríos Puerto Viejo & Sarapiquí, 100 m, 12 July 1979, *J. H. Beach 1467* (holotype, DUKE; isotypes, CR, F-1910704, MO-316875, MO-316876).

This species is known from Costa Rica at 100–900 m.

20. Palicourea roseocremea (Dwyer) C. M. Taylor, comb. nov. Basionym: *Coussarea roseocremea* Dwyer, Ann. Missouri Bot. Gard. 67: 133. 1980. *Psychotria roseocremea* (Dwyer) C. M. Taylor, Novon 5: 205. 1995. TYPE: Panama. Panamá: El Llano–Cartí Hwy., 6–10 km N of El Llano, 13 Apr. 1973, *R. L. Dressler 4334* (holotype, MO-2126258).

This species is known from eastern Panama at 300–400 m.

21. Palicourea sousae (Lorence & Dwyer) Lorence, comb. nov. Basionym: *Psychotria sousae* Lorence & Dwyer, Bol. Soc. Bot. México 47: 59, fig. 3c, d. 1987. TYPE: Mexico. Oaxaca: mpio. de Matías Romero, zona de Uxpanapa, lomas E de Arroyo Hamaca, 9.5 km SE de La Floresta, a 21.5 km S de Esmeralda, 400 m, 22 May 1981, *T. Wendt, A. Villalobos, I. Navarrete & J. Anguiano 3282* (holotype, MEXU; isotypes, CHAPA, PTBG-9946).

This species is known from southern Mexico (Oaxaca, Veracruz) at 400–1560 m (Lorence & Dwyer, 1987). It has been collected only rarely.

22. Palicourea tetragona (Donn. Sm.) C. M. Taylor & Lorence, comb. nov. Basionym: *Cephaelis tetragona* Donn. Sm., Bot. Gaz. 61: 376. 1916. TYPE: Costa Rica. Cartago: forêts de Tuis, 650 m, Oct. 1897, *A. Tonduz 11354* (lectotype, designated here, US-943500).

Psychotria chiapensis Standl., Contr. U.S. Natl. Herb. 23: 1390. 1926. TYPE: Mexico. Chiapas: Finca Mexiquito, July 1913, *C. A. Purpus 6963* (holotype, US-567237, photos MEXU, PTBG; isotype, GH not seen).

Habitat and distribution. This species is known from central Mexico (San Luis Potosí, Veracruz) to

Panama at 40–1700 m. It is often locally very common in primary and secondary vegetation.

Discussion. Lorence (1999) reported two syntypes of *Cephaelis tetragona* deposited at US, the specimen cited above and the syntype *A. Tonduz 12997*, from the same locality. However, only the specimen cited above had an accession number and photos cited by Lorence, and only this specimen is included in the online type database for that institution and accordingly it is here chosen as the lectotype. In the same work, Lorence also incorrectly listed the name *Psychotria chiapensis* as a replacement name for *Cephaelis tetragona*, but these were actually published as separate species; the publication information and type of *P. chiapensis* are here clarified.

23. Palicourea thornei (Lorence) Lorence, comb. nov. Basionym: *Psychotria thornei* Lorence, Novon 4(2): 127, fig. 5. 1994. TYPE: Mexico. Chiapas: Selva Negra, ca. 15 km N of Pueblo Nuevo Solistahuacán, canyon, montane rainforest of Selva Negra on slopes, 5700 ft., 24 June 1970, *R. Thorne & E. Lathrop 40389b* (holotype, CAS).

This species is known from southern Mexico (Chiapas) at 1600–1770 m.

24. Palicourea tutensis (Dwyer) C. M. Taylor, comb. nov. Basionym: *Psychotria tutensis* Dwyer, Ann. Missouri Bot. Gard. 67(2): 434. 1980. TYPE: Panama. Veraguas: Cerro Tute, ca. 10 km NW of Santa Fé, ridge top, above 1000 m, 19 June 1975, *S. Mori 6783* (holotype, MO-2338505).

This species is known from western Panama at 950–1250 m.

25. Palicourea umbelliformis (Dwyer & M. V. Hayden) C. M. Taylor, comb. nov. Basionym: *Psychotria umbelliformis* Dwyer & M. V. Hayden, Ann. Missouri Bot. Gard. 55: 44. 1968. TYPE: Panama. Panamá: betw. peaks of Cerro Trinidad, saddle on SE slope, 5 May 1968, *J. H. Kirkbride Jr. & J. A. Duke 1641* (holotype, MO-1968366).

This species is known from Costa Rica and Panama at 20–1400 m.

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Yasunia (Lauraceae), a New Genus with Two Species from Ecuador and Peru

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ABSTRACT. A new genus of the Lauraceae, *Yasunia* van der Werff, is described. It consists of two undescribed species, *Y. quadrata* van der Werff and *Y. sessiliflora* van der Werff, known from lowland rainforest in Ecuador and Peru. The new genus is closely related to *Beilschmiedia* Nees, but differs in its conspicuous, pubescent staminodia, exserted stamens, and reduced number of stamens. The relationships of the new genus and its placement in the Cryptocaryeae are discussed.

Key words: Ecuador, IUCN Red List, Lauraceae, Peru, *Yasunia*.

With some regularity, undescribed species are found among the Lauraceae specimens sent to the Missouri Botanical Garden as gifts for identification. New genera, however, are not encountered frequently. It was, therefore, a surprise to receive specimens representing two undescribed species that could not be accommodated in any of the known genera of Lauraceae. One of the species was collected in the Amazonian lowlands of Ecuador, the second in the border region of Peru and Brazil, also in lowland rainforest. The first collection of the Ecuadorian species, made in 1993, was largely in bud and had a few young flowers that did not show much detail; it remained among the undetermined specimens. The second collection was initially not recognized as Lauraceae; it has opposite leaves and a large (ca. 6 × 4 cm) fruit without a cupule or remnants of a perianth. Subsequently this species was collected in the 50-ha plot of the Parque Nacional Yasuní from numbered trees; this made recollecting easier, although finding the very small flowers on the tree was still not easy. From these collections, the following picture emerged: a medium-sized tree with opposite leaves; inflorescences 4–5 cm long, with sessile, clustered flowers; flowers with six (very rarely four) small, equal tepals, three (very rarely two) 2-locular stamens, and three (rarely two) thick, columnar staminodia with a conspicuous fringe of hairs at the top; tepals, stamens, and staminodia united at the base and falling off as one unit in old flowers; and large fruit, without remnants of the tepals seated on the pedicel. This combination of characters did not fit in any of the known Neotropical genera of Lauraceae. The absence of a cupule and dehiscing floral parts in old flowers suggested a relationship with *Beilschmiedia* Nees. However, *Beilschmiedia* and related genera (Cryptocaryeae in van der Werff & Richter, 1996, and Chanderbali et al., 2001; *Cryptocarya* group in Rohwer & Rudolph, 2005) have a characteristic inflorescence structure with the lateral flowers of a cyme subopposite (inflorescences type 3 in van der Werff & Richter, 1996), and the flowers of the new species were so densely congested that no branching pattern could be recognized. The collection of the second species, from the upper Río Utiquinia in Ucayali (Peru) near the border with Brazil, was made in 2003. It has dimerous flowers, with four tepals, four 2-locular stamens, and two cylindrical, pubescent staminodia. The floral parts are united at the base and fall off as a unit. The inflorescence is laxer than in the Ecuadorian species and shows the characteristic branching of the *Cryptocarya* R. Br. group. An additional character of both species is found in the stamens: they are longer than the tepals and the anthers are exserted. In most other members of the *Cryptocarya* group, the stamens are typically shorter than the tepals and included in the flowers. The *Cryptocarya* group is represented in the Neotropics by the genera *Beilschmiedia* and *Cryptocarya*. In addition to the exserted stamens, *Cryptocarya* differs from the new genus in having nine stamens and the ovary in fruit fully enclosed in and fused with the accrescent hypanthium. The closest relative of the new genus is *Beilschmiedia*. The differences are as follows: *Beilschmiedia* has flowers with nine stamens and three staminodia or, in the case of *B. hexanthera* van der Werff, six stamens and six staminodia; the locelli are

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introrse on the outer six stamens, extrorse on the inner three, whereas the new genus has flowers with three or four (rarely two) stamens and two or three staminodia. The anthers of the species of the new genus are exserted with large, apical locelli, while those of *Beilschmiedia* species are included in the flowers or rarely have their tips exposed and the locelli are introrse (outer two whorls) or extrorse (inner whorl of stamens).

Yasunia van der Werff, gen. nov. TYPE: *Yasunia sessiliflora* van der Werff.

Hoc genus *Beilschmiediae* Nees fructibus nudis sine cupulis et cymis irregularibus affine, sed ab ea staminibus tribus vel quattuor tepala superantibus atque staminodiis columnaribus pubescentibus recedit.

Trees. Leaves opposite, subopposite, or alternate, entire. Inflorescences in axils of leaves, paniculate; flowers subsessile, clustered, when 3 flowers terminate an inflorescence branchlet, the 2 lateral flowers not strictly opposite. Tepals 6 or 4, wider than long; stamens 3 or 4, filaments very short or lacking, anthers bilocellate, longer than the tepals; staminodia 2 or 3, columnar, the tip densely pubescent; tepals and stamens fused at the base and falling off in old flowers together, leaving the young fruit fully exposed on the pedicel. Mature fruit (known only in *Yasunia sessiliflora*) ellipsoid, ca. 6 × 3.5 cm, scurfy, without remnants of the hypanthium or tepals.

Discussion. A genus of two species, occurring in the Amazonian lowlands of Ecuador and Peru, *Yasunia* is characterized by its flowers with three or four stamens, the floral parts united at the base and falling off as a unit, the distally pubescent columnar staminodia, and the fruits seated fully exposed on the pedicel. Of its two species, one has dimerous flowers, while the second species has trimerous flowers. The generic name refers to the locality where the type species was collected (Parque Nacional Yasuní, in Ecuador).

1. **Yasunia quadrata** van der Werff, sp. nov. TYPE: Peru. Ucayali: Coronel Portillo, cuenca del Río Utiquinia, Quebrada Espjoyacu, afluente de la quebrada Manuela, 07°56.67′S, 73°53.61′W, 30 June 2003 (fls.), *J. G. Graham 2369* (holotype, MO; isotypes, F, MOL). Figures 1, 2A.

Haec species a *Yasunia sessiliflora* van der Werff tepalis 4 (haud 6), staminodiis 2 (haud 3) atque foliis glabris rigidioribus recedit.

Trees, 25–30 m; twigs angular to terete, sparsely appressed pubescent when young, soon becoming glabrous, densely and minutely lenticellate; terminal buds densely appressed pubescent. Leaves opposite or subopposite when young, becoming alternate when old, 7–10 × 3–5 cm, glabrous on both surfaces, young leaves densely gland-dotted on the abaxial surface, the gland dots less visible on older leaves, these stiffly chartaceous, elliptic, pinnately veined, secondary veins poorly visible, 9 to 12 on each side, secondary and tertiary venation weakly raised to immersed, leaf base acute, apex obtuse to rounded, margin slightly revolute toward base; petioles 10–17 mm, flat or somewhat canaliculate. Inflorescences mostly along leafless short shoots in the axils of leaves, rarely single in the axils of leaves, 2.5–7 cm, sparsely appressed pubescent, paniculate, flowers in dense clusters, usually 3 together, but lateral flowers not strictly opposite. Flowers glabrous, funnel-shaped, dimerous, 1–1.2 × ca. 1 mm, tepals 4, ca. 0.5 × 0.5 mm, spreading, stamens 4, sessile, triangular, ca. 0.5 × 1 mm, 2-locular, the cells introrse-apical, large and occupying most of the anther, the basal part pubescent, stamens erect, longer than the spreading tepals, staminodia 2, ca. 0.5 mm, columnar, the apex flat and with a whorl of hairs; 2 globose glands present at the base of the staminodia; pistil glabrous, ca. 1 mm, the receptacle deep, glabrous inside; tepals united in the lower 2/3, falling off together with the stamens in old flowers and leaving the pistil fully exposed on the pedicel. Mature fruit not known.

Discussion. Characteristic for *Yasunia quadrata* are the dimerous flowers with four tepals and four stamens. The stamens are opposite the tepals and represent whorls I and II, while the staminodia represent whorl III. Whorl IV is lacking. It is the only Neotropical species of the Lauraceae with dimerous flowers. It is known only from the type collection made in eastern Peru in the border region with Brazil.

IUCN Red List category. The distribution for the new species is incompletely known, and only a conservation assessment of Data Deficient (DD) can be made following IUCN Red List criteria (IUCN, 2001).

2. **Yasunia sessiliflora** van der Werff, sp. nov. TYPE: Ecuador. Orellana: Parque Nac. Yasuní, 76°30′W, 00°38′S, 200–300 m, 9 June 2009 (fls.), *A. J. Pérez, M. Zambrano & M. Pabón 4230* (holotype, QCA; isotype, MO). Figures 2B, 3.

Haec species a *Yasunia quadrata* van der Werff tepalis 6 (haud 4), staminibus 3 (haud 4) atque foliis tenuioribus recedit.

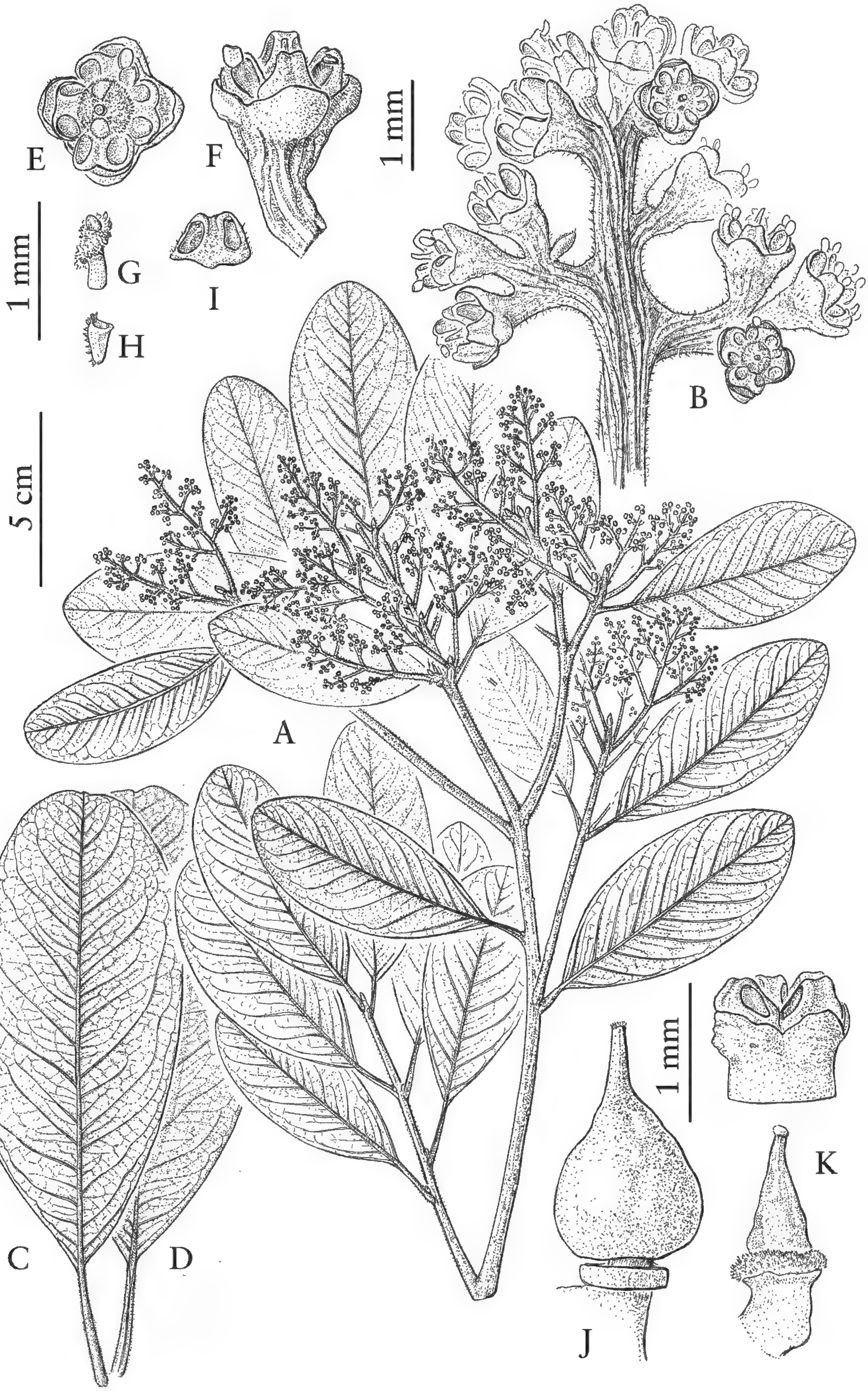

Figure 1. *Yasunia quadrata* van der Werff. —A. Habit. —B. Inflorescence. C, D. Leaves. —C. Abaxial blade surface. —D. Adaxial blade surface. —E. Flower seen from above. —F. Flower seen from side. —G, H. Staminodes. —I. Stamen. —J. Young fruit. —K. Old flower; detached, basally united tepals seen positioned above the pistil. Drawn from the holotype, *Graham 2369* (MO). No scale bar provided for C, D; same 1-mm scale bar applies to E–I; same 1-mm scale bar applies to J, K.

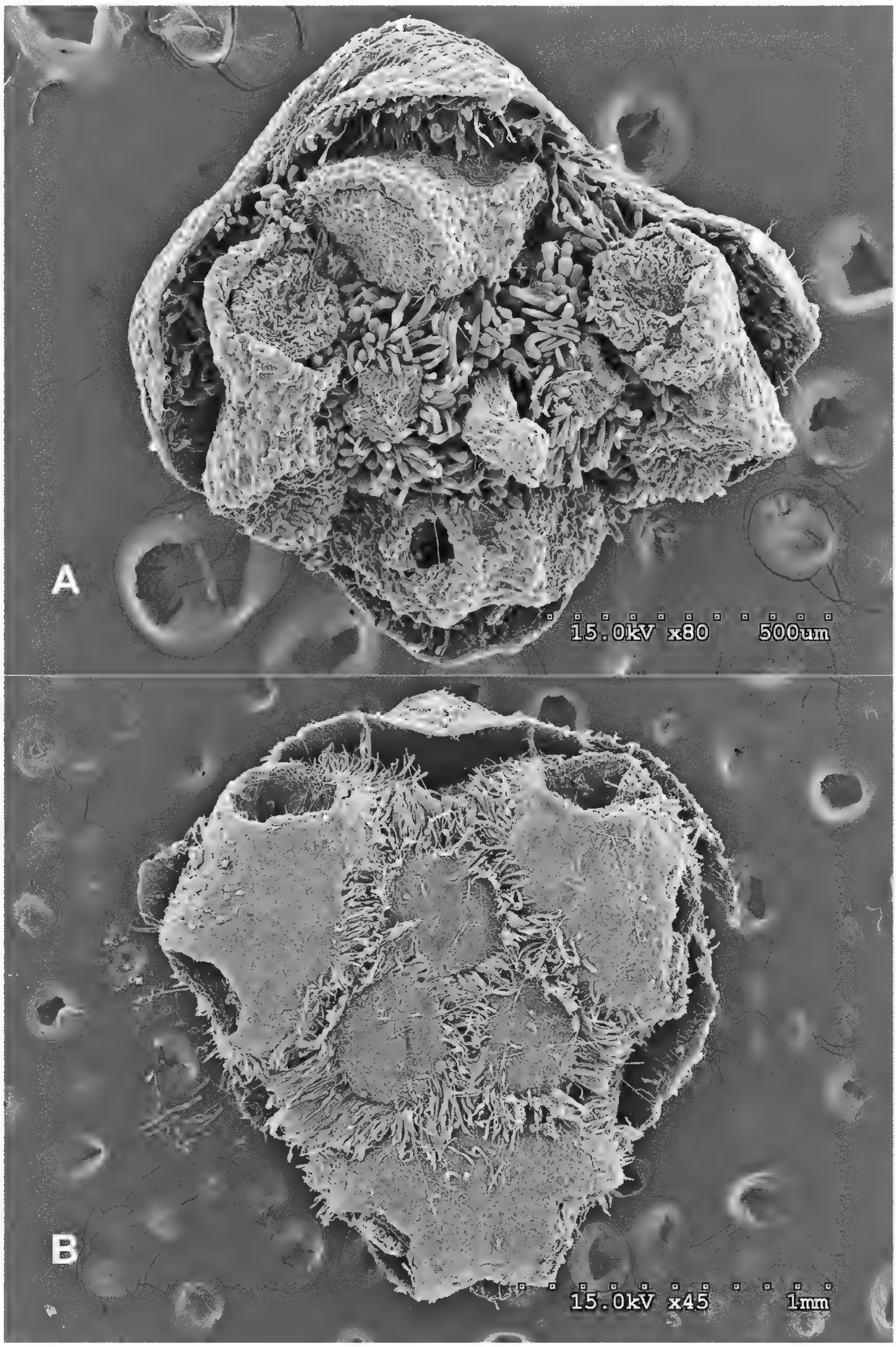

Figure 2. —A. SEM image of a flower of *Yasunia quadrata* van der Werff, from the holotype *Graham 2369* (MO). —B. SEM image of a flower of *Yasunia sessiliflora* van der Werff, from the isotype *Pérez et al. 4230* (MO).

Tree, to 18 m; twigs terete, appressed pubescent when young, becoming glabrous with age; terminal buds densely appressed pubescent. Leaves 11–20 × 5–10 cm, opposite, chartaceous, elliptic to narrowly elliptic, base obtuse to acute, apex acute, adaxial surface glabrous, abaxial surface with some appressed hairs along the major veins, otherwise glabrous, major veins and reticulation slightly raised on the adaxial surface, more prominently so on the abaxial surface; lateral veins 6 to 10 on each side; petioles 7–13 mm, flat above, with a similar indument as the twigs. Inflorescences to 4 cm, paniculate, moderately appressed pubescent, in the axils of leaves. Flowers 1.5–2 mm diam., sessile, grouped in dense clusters, green, shallowly bowl-shaped; tepals equal, 6, rarely 4, united at the base, the free part ca. 0.5–1 mm, spreading to half-erect, appressed pubescent on the outer surface, with a few hairs on the inner surface;

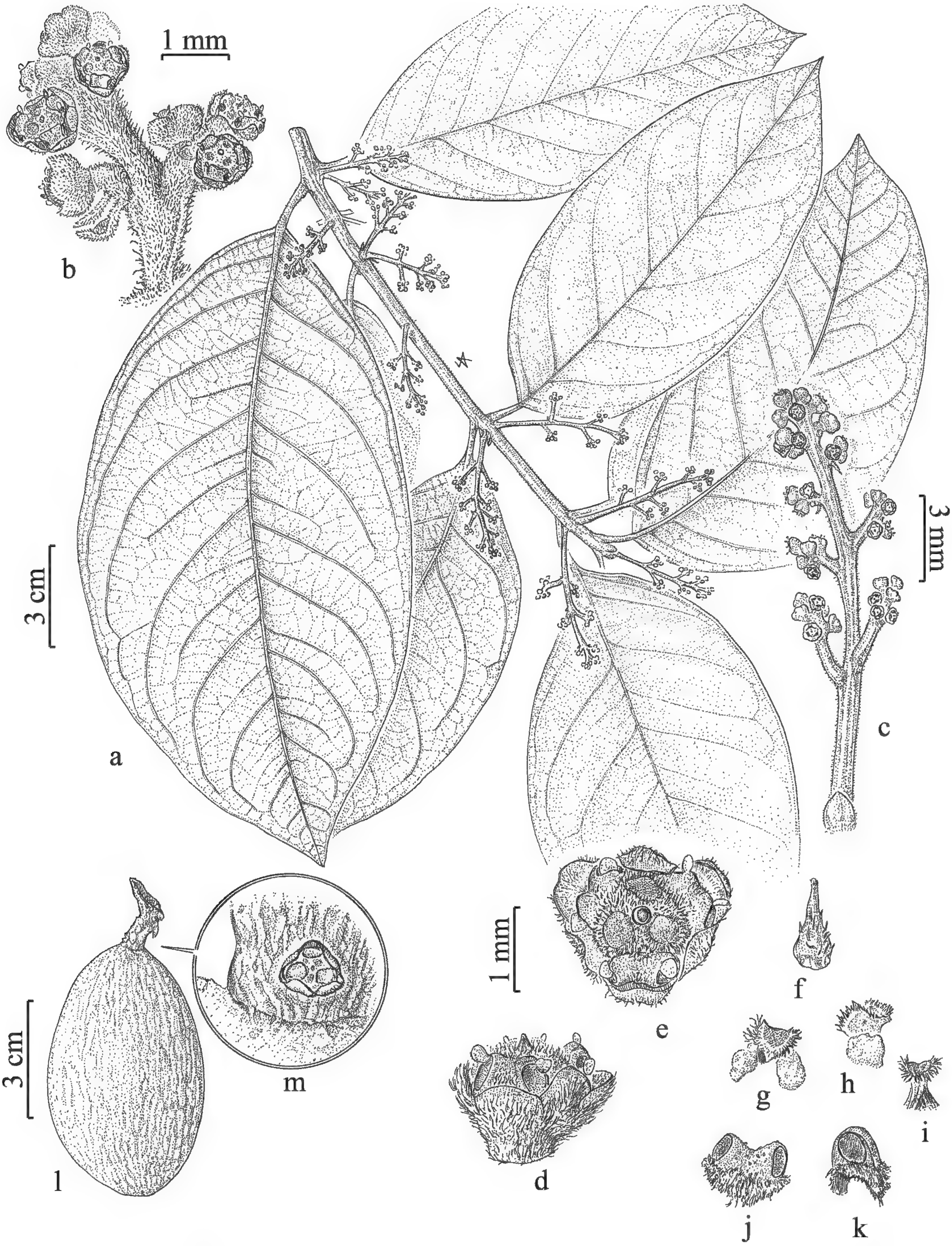

Figure 3. *Yasunia sessiliflora* van der Werff. —A. Habit. —B, C. Details of inflorescences. —D. Flower seen from side. —E. Flower seen from above. —F. Pistil. —G–I. Staminodia. —J. Frontal view of stamen. —K. Side view of stamen. —L. Fruit. —M. Remnant of old flower on pedicel of fruit. A–K from the isotype *Pérez et al. 4230* (MO); L, M from *Neill et al. 11089* (MO).

stamens 3, rarely 2, 2-locular, longer than the spreading tepals; the filaments very short and with a fringe of hairs, the locelli large, lateral-distal; staminodia 3, rarely 2, ca. 0.5 mm, columnar, with a broad, flat top and a ring of hairs distally, readily visible, 2 glands present at the base of the staminodia, partly fused with the receptacle; pistil turbinate, ca. 0.8 mm, with a few hairs near the base, otherwise

glabrous; receptacle shallow, glabrous inside. Fruit ellipsoid, ca. 6 × 4 cm, without remnants of the floral parts, scurfy outside.

Discussion. Characteristic for *Yasunia sessiliflora* are the sessile flowers with three 2-locular stamens, large scurfy fruits, absence of cupule, and opposite leaves. Infrequently, dimerous flowers with two stamens and four tepals occur, and a few flowers with four stamens and eight tepals were present. It is not clear which floral whorls are developed in *Y. sessiliflora*. The stamens are opposite the outer tepals and represent either whorl I or III, while the staminodia, opposite the inner tepals, represent either whorl II or IV. Either way, this is an unusual arrangement. When a whorl of staminodia with glands at the base is present, it represents nearly always whorl III and is thus opposite the outer tepals. The position of the staminodia in *Y. sessiliflora*, opposite the inner tepals, is very rare, if not unique, in the family. Flowers with six tepals and three 2-locular stamens are uncommon among Neotropical Lauraceae and have been reported from four genera, *Licaria* Aubl., *Mezilaurus* Kuntze ex Taub., *Mocinnodaphne* Lorea-Hern., and a few species of *Aiouea* Aubl. (van der Werff, 1991a). None of these have the relatively large, flat-topped staminodia characteristic of *Yasunia*. In addition, *Licaria* species have well-developed, cup-shaped cupules and alternate leaves, although a few species have opposite leaves (Kurz, 2000); *Mezilaurus* species have the fruit subtended by small, plate-like cupules and have clustered leaves (van der Werff, 1987); *Mocinnodaphne* has alternate leaves with domatia in the axils of the basal lateral veins and the fruit subtended by a small cupule; and the *Aiouea* species with three stamens have small cupules and alternate leaves (Renner, 1982).

IUCN Red List category. The distribution for the new species is incompletely known, and only a conservation assessment of Data Deficient (DD) can be made following IUCN Red List criteria (IUCN, 2001).

Paratypes. ECUADOR. **Orellana:** Parque Nac. Yasuní, 1 Nov. 2008, *A. J. Pérez & P. Alvia 4035, 4036, 4037* (all QCA), 26 Sep. 2000, *G. Villa 508* (MO), 1–11 Sep. 1993, *M. Aulestia & J. Andi 383* (MO, QCNE); Pastaza, Río Acaro or Challuayacu, 19 Jan. 1998, *D. Neill, A. Alvarez, H. Vargas & R. Mayanche 11089* (K, MO, QCNE).

Description of Cuticle Features in *Yasunia*

Potameia Thouars is the only other genus in the *Beilschmiedia* group with dimerous flowers. Although the large staminodia of *Yasunia* separate this genus from *Potameia*, a study of the cuticle was undertaken to establish additional differences. Cuticular characters on leaves are known to be useful in defining groups of species or genera of Lauraceae (Nishida & van der Werff, 2007), and this supports combining the two new species into one taxon close to *Beilschmiedia*. *Yasunia quadrata* and *Y. sessiliflora* share common cuticular features, which include the anticlinal cell walls "branched" (straight but with protrusions along the walls) in the adaxial epidermis (Figs. 4-1A, 4-2A), granular periclinal cell walls in the abaxial epidermis (Figs. 4-1B, 4-2B), and stomata with lip-shaped lower ledges (Figs. 4-1B, 4-2B). These features are similar to those of some *Beilschmiedia* species from South America, such as *B. curviramea* (Meisn.) Kosterm. (Figs. 4-3A, 4-3B) (see Nishida & Christophel, 1999). The cuticles of the *Potameia* species have their anticlinal cell walls nonbranched but sinuous and the periclinal walls smooth (Figs. 4-4A, 4-4B), and these characters clearly discriminate the *Potameia* species from the dimerous *Yasunia* species and further support the recognition of *Yasunia* as a genus distinct from *Potameia*.

Pollen in *Yasunia*

In a study of pollen from 17 Neotropical genera, Raj and van der Werff (1988) found that most Neotropical Lauraceae had inaperturate, spheroidal pollen grain ornamented with spinules of varying size and density. *Cryptocarya* is an exception; its pollen has a smooth or wrinkled surface without spinules. The pollen of *Yasunia sessiliflora* is inaperturate, spheroidal, and spinulose like the pollen of the great majority of the Neotropical Lauraceae, but unlike the pollen of *Cryptocarya*.

Discussion

Richter (1981) was the first to place *Cryptocarya*, *Beilschmiedia*, and related genera in one group based on similarities of wood and bark anatomy. Van der Werff and Richter (1996) applied the name Cryptocaryeae to this group of genera and pointed to the characteristic inflorescence structure shared by these genera. They included the following genera in the Cryptocaryeae: *Beilschmiedia*, *Cryptocarya*, *Endiandra* R. Br., *Potameia*, and *Triadodaphne* Kosterm. DNA-based phylogenies (Chanderbali et al., 2001; Rohwer & Rudolph, 2005) confirmed the monophyly of the Cryptocaryeae; these studies included species of *Eusideroxylon* Teijsm. & Binn., *Potoxylon* Kosterm., *Aspidostemon* Rohwer & H. G. Richt., *Cryptocarya*, *Beilschmiedia*, *Endiandra*, and *Potameia*. Within the Cryptocaryeae, two groups of genera can be recognized: the paraphyletic *Cryptocarya* group

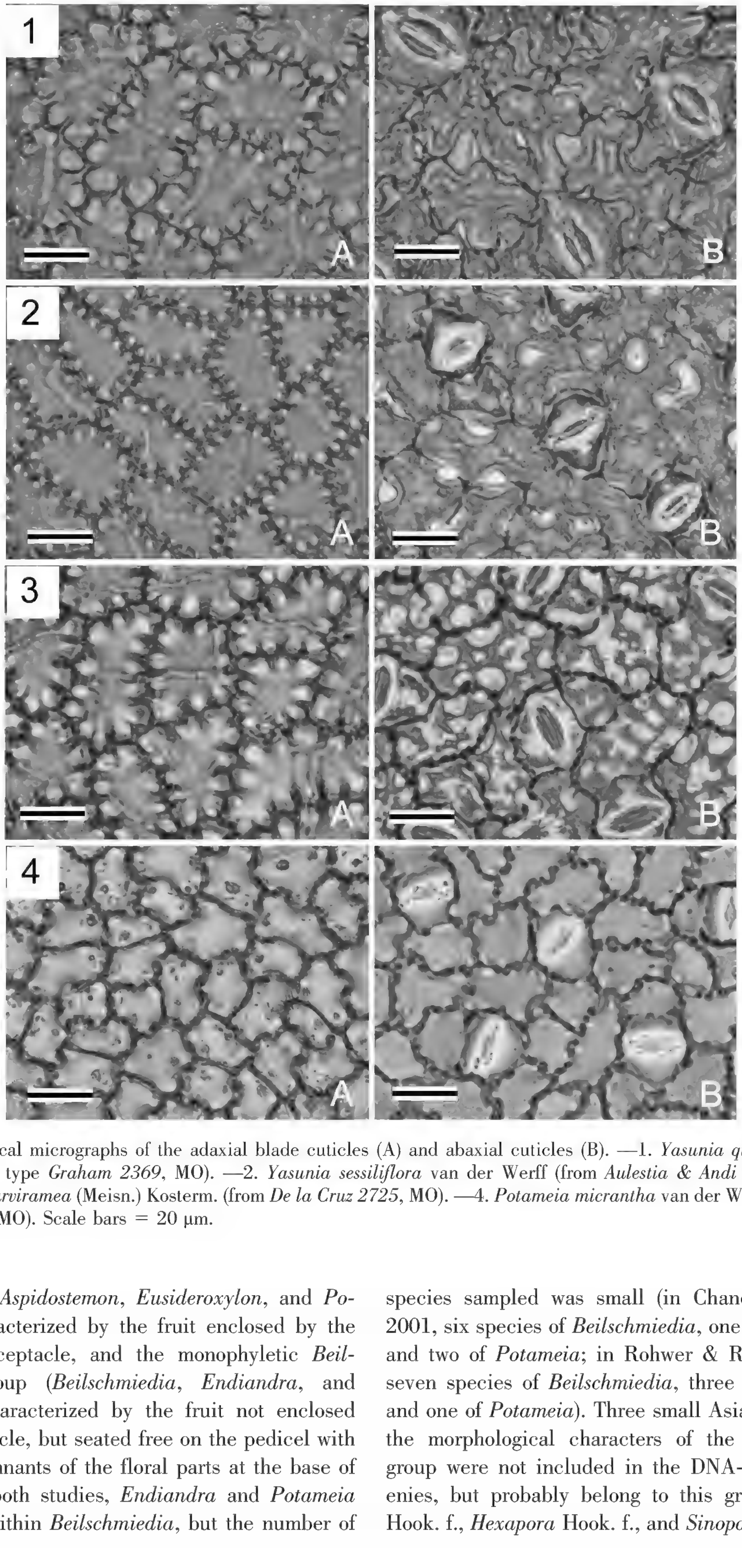

Figure 4. Optical micrographs of the adaxial blade cuticles (A) and abaxial cuticles (B). —1. *Yasunia quadrata* van der Werff (from the type *Graham 2369*, MO). —2. *Yasunia sessiliflora* van der Werff (from *Aulestia & Andi 383*, MO). —3. *Beilschmiedia curviramea* (Meisn.) Kosterm. (from *De la Cruz 2725*, MO). —4. *Potameia micrantha* van der Werff (from *Schatz & Miller 2499*, MO). Scale bars = 20 μm.

(*Cryptocarya*, *Aspidostemon*, *Eusideroxylon*, and *Potoxylon*), characterized by the fruit enclosed by the accrescent receptacle, and the monophyletic *Beilschmiedia* group (*Beilschmiedia*, *Endiandra*, and *Potameia*), characterized by the fruit not enclosed by the receptacle, but seated free on the pedicel with or without remnants of the floral parts at the base of the fruit. In both studies, *Endiandra* and *Potameia* were nested within *Beilschmiedia*, but the number of species sampled was small (in Chanderbali et al., 2001, six species of *Beilschmiedia*, one of *Endiandra*, and two of *Potameia*; in Rohwer & Rudolph, 2005, seven species of *Beilschmiedia*, three of *Endiandra*, and one of *Potameia*). Three small Asian genera with the morphological characters of the *Beilschmiedia* group were not included in the DNA-based phylogenies, but probably belong to this group (*Syndiclis* Hook. f., *Hexapora* Hook. f., and *Sinopora* J. Li, N. H.

Xia & H. W. Li). Species of these genera are rarely collected, and no DNA material was available for the phylogenetic studies. *Beilschmiedia* is the only genus of this group occurring in the Neotropics; the other five genera are known from Madagascar, tropical Asia, Australia, and Oceania. The main characters separating the genera are presented in Table 1. *Triadodaphne* was recognized on the strength of its unequal tepals, with the outer three larger than the inner three. In other characters it does not differ from *Endiandra*, and it is now considered a synonym of *Endiandra* (Rohwer, 1993). *Brassiodendron* C. K. Allen was described by Allen (1942), differing from *Beilschmiedia* and *Endiandra* in having six stamens versus nine stamens in *Beilschmiedia* and three stamens in *Endiandra*. Hyland (1989) studied the six Australian species of the *Beilschmiedia* group with six stamens and placed them in either *Endiandra* or *Beilschmiedia*. Rohwer (1993) recognized *Brassiodendron* as a distinct genus. Because several other genera of Lauraceae include species with nine and six or three and six stamens (van der Werff & Richter, 1996), we follow Hyland and do not recognize *Brassiodendron* as a distinct genus. Of the seven genera listed in Table 1, three are reasonably well known. *Beilschmiedia* is a large, pantropical genus characterized by having nine stamens. A few species placed in *Beilschmiedia* have only six stamens in two whorls; such species are known from Australia (Hyland, 1989), South America (van der Werff, 1995), and Vietnam (an unidentified species, pers. obs.). One species from Madagascar, *B. pedicellata* van der Werff, includes specimens with dimerous flowers and has thus six stamens in three whorls (van der Werff, 2003). *Endiandra* is also well known and restricted to tropical Asia, Australia, and Oceania. It is characterized by having three stamens, but a few species have six stamens in two whorls or are dimerous and have two stamens (Hyland, 1989). The third reasonably well-known genus is *Potameia*, which is endemic to Madagascar. Most species have dimerous flowers with four 2-locular stamens, although one species has four 1-locular stamens (van der Werff, 1991b) and one species has two 1-locular stamens (van der Werff, 1996). These three genera are defined by the number of stamens and whether the flowers are dimerous or trimerous, but each include a number of exceptions. The other three Asian genera included in Table 1 are poorly known, and their character states are taken from the literature. *Syndiclis* (known from Bhutan, China, Thailand, and Vietnam) appears very similar to *Potameia*; the main difference (in addition to the distribution) is the number of staminodia: four in *Syndiclis* and two or none in *Potameia*. There is no consensus on the importance of this difference.

Table 1. Comparison between genera of the *Beilschmiedia* group. Numbers in parentheses indicate less frequent character states.

	Beilschmiedia	*Potameia*	*Endiandra*	*Syndiclis*	*Hexapora*	*Sinopora*	*Yasunia*
Distribution	pantropical	Madagascar	tropical Asia, Oceania	Bhutan, China, Vietnam, Thailand	Malaysia	China	Ecuador, Peru
No. of stamens	9(6)	4(2)	3(6)	4(5 or 6)	6	6	4, 3(2)
Whorls	I, II, III (I, II)	I, II	III (II, III)	I, II (III)	I, II	I, II	I, II
Leaf position	alternate or opposite	alternate	alternate	alternate	alternate	alternate	opposite or alternate
Merosity	trimerous	dimerous	trimerous (rarely dimerous)	dimerous (rarely trimerous)	trimerous	trimerous	dimerous or trimerous
Staminodia shape	stipitiform, often with sagittate apex	stipitiform	stipitiform	stipitiform	thick	thick	thick
Glands enlarged	no	no	sometimes	no	absent	absent	no
Tepals persistent	rarely	yes	rarely	no	yes	yes	no
Stamens	included	included	included or exserted	exserted	exserted	exserted	exserted

Rohwer (1993) treated *Syndiclis* as a synonym of *Potameia*, while Li et al. (2008) recognized *Syndiclis* as distinct. *Hexapora* and *Sinopora* are monotypic, and both have trimerous flowers with six stamens; in *Hexapora* the locelli are extrorse, while in *Sinopora* the locelli are apical. According to the descriptions and illustrations, both *Hexapora* and *Sinopora* have six rather large, pubescent staminodia and floral parts that persist at the base of the fruits (Hooker, 1886; Kochummen, 1989; Li et al., 2008). Like *Hexapora* and *Sinopora*, *Yasunia* has relatively large, pubescent staminodia, but it differs in its number of stamens (three or four vs. six) and in its deciduous perianth parts in the fruiting stage. Staminodia in most Lauraceae are small, stipitiform, or lacking. Conspicuous staminodia are known only in the three small genera related to *Beilschmiedia* (*Hexapora*, *Sinopora*, and *Yasunia*) and *Aspidostemon*, a genus with opposite leaves and fruits fully enclosed by the accrescent hypanthium; it is related to *Cryptocarya* and endemic to Madagascar (van der Werff, 2006).

In conclusion, the genera in the *Beilschmiedia* group are characterized by stamen number, trimerous versus dimerous flowers, deciduous or persistent floral parts in fruit, and shape of stamens and staminodia. However, these characters are variable in the larger genera *Beilschmiedia*, *Endiandra*, and *Potameia*, and to a lesser degree in the small genera *Syndiclis* and *Yasunia*, and these genera are thus poorly defined. Two approaches are possible in this situation. The first, taken here, is to continue recognizing a number of genera in the *Beilschmiedia* group based on the characters given above while accepting that these characters are not exclusive for a particular genus. The second approach is to sink the genera in a greatly expanded *Beilschmiedia* characterized by its inflorescence structure and its fruit seated freely on a pedicel with or without remnants of the perianth at the base. This approach would be in agreement with the DNA-based studies (Chanderbali et al., 2001; Rohwer & Rudolph, 2005), where *Endiandra* and *Potameia* formed clades nested within *Beilschmiedia*. However, this approach has not been taken for three reasons: (1) the number of species of the *Beilschmiedia* group included in those studies is small—18 out of an estimated 380 species; (2) it would require a large number of new combinations and the long-established genera *Endiandra* and *Potameia* would disappear; and (3) it is likely that the merged genera would be recognized as infrageneric taxa. Such a lowering of rank will not substantially increase our understanding of relationships in the *Beilschmiedia* group.

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Rustia kosnipatana (Rubiaceae, Cinchonoideae), a New Species from the Kosñipata Region in Southern Peru

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Abstract. Three species of *Rustia* Klotzsch (Rubiaceae, Cinchonoideae) were previously known from Peru, *R. rubra* Standl. ex D. R. Simpson, *R. schunkeana* Delprete, and *R. viridiflora* Delprete. A fourth species from the Kosñipata Valley (Cuzco Department), *R. kosnipatana* S. Will & C. M. Taylor, is newly described and illustrated here. This tree species differs in its inflorescences with erect pink flowers, fusiform flower buds, and corollas with dense pubescence in the throat and the lobes longer than the tubes. This is the first record of *Rustia* in the southern zone of Peru.

Resumen. Tres especies de *Rustia* Klotzsch (Rubiaceae, Cinchonoideae) se conocen de Perú: *R. rubra* Standl. ex D. R. Simpson, *R. schunkeana* Delprete y *R. viridiflora* Delprete. Una cuarta del valle de Kosñipata (Departamento de Cuzco), *R. kosnipatana* S. Will & C. M. Taylor, se describe e ilustra aquí. La especie se distingue por su hábito arbóreo, las inflorescencias con flores erectas y rosadas, las yemas florales fusiformes y las corollas con densa pubescencia en la garganta y los lóbulos más largos que el tubo. Este es el primer registro de *Rustia* en la zona sur de Perú.

Key words: IUCN Red List, Neotropics, Peru, Rondeletieae, Rubiaceae, *Rustia*.

Rustia Klotzsch (Rubiaceae, Cinchonoideae) is a Neotropical genus of about 15 species, found from Guatemala to Peru and southeastern Brazil (Delprete, 1999). The genus includes understory shrubs to mid-canopy trees of primary and secondary evergreen forests, from sea level up to 2000 m. *Rustia* is distinguished by its combination of caducous, triangular, interpetiolar stipules; leaves often with pellucid glands; terminal, multiflowered, paniculate or thyrsiform inflorescences; corollas with well-developed tubes and the lobes valvate in bud; poricidal anthers; and loculidal, woody to papery, generally ellipsoid to obovoid capsules with numerous small, angled to flattened seeds. The calyx limbs are persistent on the fruits but in general reduced to a dentate or sinuate margin. A few other Rubiaceae also have leaves with pellucid-punctate leaves, e.g., *Heterophyllaea* Hook. f., but this character is unusual in Rubiaceae. *Rustia* belongs to a group of genera whose relationships within the Rubiaceae are not yet clear. It was included in the Rondeletieae by Delprete (1999), but subsequent study (Rova et al., 2002) found it related to several Neotropical genera that had previously been placed in several other tribes, and Robbrecht and Manen (2006) found these genera mostly unrelated and did not classify *Rustia*, but placed its apparent sister genus *Molopanthera* Turcz. in Henriquezieae.

The species of *Rustia* treated by Delprete (1999) were distinguished by morphological characters, and in general also show notable biogeographic separation with the species having relatively similar corollas all occupying distinct ecological and geographic ranges. Delprete considered the shape of the flower bud, fusiform versus clavate, to be a species-level character. Anthers in *Rustia* open by pores near the apex instead of linear slits; this is uncommon in the Rubiaceae. Puff et al. (1995) noted that although the stamens of *Rustia* do not form an anther cone and therefore do not fall into the "Solanum-type" of pollen flowers category, the presence of buzz-pollination within this genus cannot be excluded, and Delprete (1999: 30) reported this pollination mechanism in *R. occidentalis* (Benth.) Hemsl. Delprete also detailed variation in the shapes of the anthers of different species, in particular these sometimes have caudate bases, various ornamentations or prolongations of the connective pubescence arranged in distinctive patterns, or an unusual spheroidal projection at the base of each theca (Delprete, 1999: 79, fig. 33, *R. schunkeana*, though not mentioned in textual description). At present, no particular functions or correla-

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tions with pollination mode have been proposed for any of these structures.

Rustia was not reported from Peru (Standley, 1936) until Simpson (1976) documented two species of this genus from here: *R. rubra* Standl. ex D. R. Simpson and *R. secundiflora* K. Schum. *Rustia* was monographed by Delprete (1999), who also reported two species from Peru: *R. rubra* and *R. schunkeana* Delprete; he treated the name *R. secundiflora* as a synonym of *R. thibaudioides* (H. Karst.) Delprete, found in Colombia, Venezuela, and adjacent Brazil, and included the Peruvian plants treated under that name by Simpson in the newly described species *R. schunkeana*. Subsequently, a third species, *R. viridiflora* Delprete, was provisionally reported from Peru based on a fruiting specimen (Ulloa Ulloa et al., 2004). Another *Rustia* species described from Peru, *R. isernii* Standl., is now treated as *Agouticarpa isernii* (Standl.) C. Persson (Persson, 2003).

We here describe a fourth species of *Rustia* from Peru, *R. kosnipatana* S. Will & C. M. Taylor, based on specimens collected during recent exploration, and provide a key to separate these four species.

KEY TO PERUVIAN SPECIES OF *RUSTIA*

1. Shrubs 3–5 m tall; corolla greenish yellow . . . . . *R. schunkeana*
1′. Trees 10–20 m tall; corolla green, red, pink, or red with green lobes; anthers without spheroidal projections.
   2. Inflorescences with pendulous flowers; corolla tubes glabrous or strigose inside, with lobes ca. 1/10 of total corolla length . . . . . *R. rubra*
   2′. Inflorescences with erect to spreading flowers; corolla tubes glabrous to densely pubescent inside, with lobes 1/4–2/3 of total corolla length.
      3. Corolla with tube 4–6 mm long, densely pubescent in throat, with lobes ca. 2/3 of total corolla length, longer than tube; southern Peru . . . . . *R. kosnipatana*
      3′. Corolla with tube 14–18 mm long, glabrous in throat, with lobes 1/4–1/3 of total corolla length, shorter than tube; northern Peru . . . . . *R. viridiflora*

Rustia kosnipatana S. Will & C. M. Taylor, sp. nov. TYPE: Peru. Cuzco: Prov. Paucartambo, Dist. Kosñipata [Qosñipata], Pillocopata, Pongo de K'conic, 12°54′S, 071°22′W, 780 m, 28 June 2003, *I. Huamantupa 3499* (holotype, CUZ; isotypes, MO 6208805, WU). Figure 1.

Haec species a congeneris lamina foliari obovata usque oblanceolata, inflorescentia paniculiformi longitudine 30 cm excedente flores erectos ferente, alabastro fusiformi, flore 10–16 mm longo (lobulis corollinis inclusis) atque corolla intus pubescente lobulis corollinis patentibus quam tubo ca. 2/3 longioribus distinguitur.

Trees to 13 m tall. *Leaves* with *blades* obovate to oblanceolate, 14–32 × 6–12 cm, cuspidate to acuminate at apex, acute at base, glabrous on both surfaces, with secondary veins 13 to 19 pairs, weakly interconnecting near margins, domatia absent, on both surfaces with costa and secondary venation prominulous and minor venation hardly visible; petioles 2–5 cm, glabrescent, swollen at base, becoming lignified and brown when dry; *stipules* triangular, 1.5–3 cm, early deciduous, in bud strongly twisted at apex and possibly resinous. *Inflorescences* paniculiform, pyramidal, 30–55 × 30–50 cm, secondary axes opposite; peduncle 6–9 cm; basalmost secondary axes 15–25 cm, glabrous; bracts subtending secondary and tertiary axes 2–4 mm; bracteoles 1–1.5 mm, obtuse to rounded, ciliolate; pedicels 2–12 mm. *Flowers* in bud fusiform; hypanthium 3–6 mm; calyx limb tubular, 2–3 mm, dentate to sinuate, glabrous, ciliolate; corolla tubular with spreading lobes, pink, 10–16 mm, glabrous outside, tube 4–6 mm, ca. 2/3 as long as lobes, internally densely pubescent around throat with two kinds of trichomes, one in a ring inside throat of ascending trichomes that dry yellow to brown, the other in discrete groups at bases of filaments of retrorse trichomes, lobes 4 to 5, 6–10 mm, densely pubescent adaxially with short ascending trichomes that dry yellow to brown; stamens 4 or 5, exserted, filaments 4–6 mm, inserted just below corolla throat, anthers narrowly oblong, ca. 2 mm, papillate; style 8–10 mm; stigmas linear, ca. 1 mm, exserted. *Fruits* not seen.

Habitat, distribution, and phenology. *Rustia kosnipatana* is known from premontane primary forest at ca. 780 m in the vicinity of Manú National Park in southern Peru; it has been collected with flowers in June.

IUCN Red List category. This species is known from one collection, which was made as part of a general survey assessing only floristic presence in a very poorly known area. Because essentially nothing is known about the population size, distribution, and dynamics of this new species and thus the condition of its habitat also cannot be assessed, it is here considered to lack adequate information for an assessment of its conservation status. Thus using the IUCN (2001) categories, this species is here considered Data Deficient (DD).

Discussion. *Rustia kosnipatana* can be distinguished from other species of *Rustia* by the combination of its obovate to oblanceolate leaf blades; its relatively large, erect, paniculiform inflorescences; its fusiform flower buds; and its relatively short corollas that are densely pubescent in the throat and have

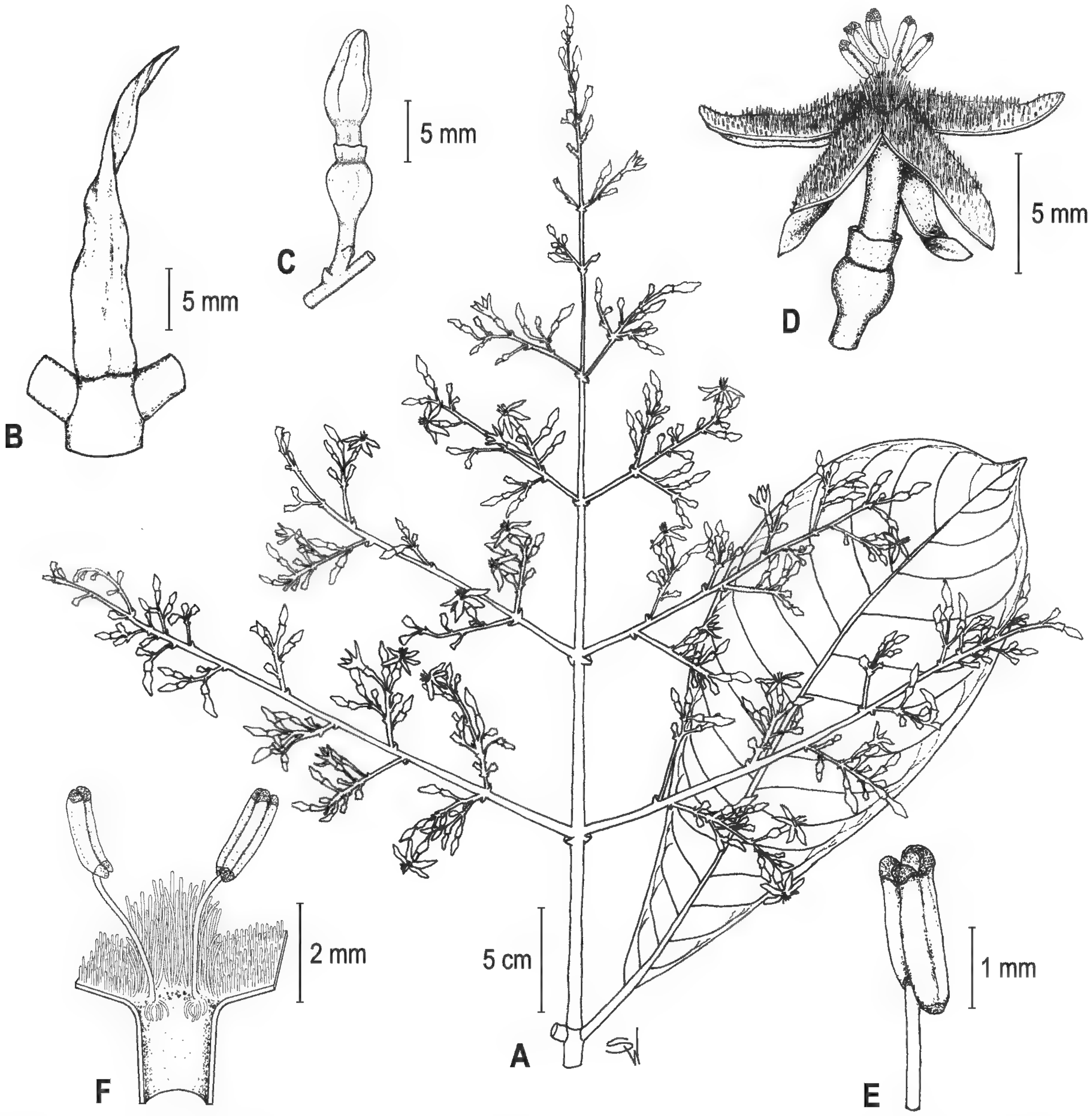

Figure 1. *Rustia kosnipatana* S. Will & C. M. Taylor. —A. Flowering stem with mature leaf. —B. Terminal stipule. —C. Flower bud. —D. Flower. —E. Stamen with open anther. —F. Detail of pubescence near the corolla throat. Drawn by S. Will from the isotype *Huamantupa 3499* (WU).

well-developed, spreading lobes that are longer than the tubes. Although only one specimen has been seen and the fruits are as yet unknown, the poricidal anthers, pellucid-punctate leaves, interpetiolar stipules, and paniculiform inflorescences clearly identify it as belonging to *Rustia*, and its corollas are unique and clearly distinguish it within this genus.

Outside of Peru, *Rustia kosnipatana* is similar in its corolla form and pubescence to two other species. One is *R. formosa* (Cham. & Schltdl. ex DC.) Klotzsch from southeastern Brazil; however, *R. formosa* differs in its larger corollas with the tubes 9–12 mm long and its lobes equal to or shorter than the tubes. *Rustia alba* Delprete, from premontane and montane forests at 1500–2400 m on the western slopes of the Andes in northwestern Ecuador, is also very similar to *R. kosnipatana*; however, *R. alba* differs in its mostly broader leaves, 13–16 cm wide; its white corollas that are glabrous in the throat and on the adaxial surfaces of the lobes; and its larger anthers, 6.5–7 mm long.

This new species was documented by the inventory of tree diversity in the Pongo of Qoñec or K'conic forest in the Kosñipata Valley, in the vicinity of the Manú Biosphere Reserve. Huamantupa Chuquimaco (2005) noted the difficult access and very limited botanical knowledge of this area, and commented that

several apparently endemic species have been found here. The name of *R. kosnipatana* refers to its collection locality.

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A New Taxon of *Linum* (Linaceae) from Southwest Anatolia, Turkey

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ABSTRACT. A new taxon, *Linum hirsutum* L. subsp. *bozdaghense* Yılmaz & Kaynak (Linaceae), is described from southwestern Anatolia, Turkey. It is similar to *L. hirsutum* subsp. *oreocaricum* P. H. Davis, from which it differs mainly in the shape and indumentum of leaves and in petal color. Diagnostic, morphological, and geographical data are discussed, and a revised key to the subspecies of *L. hirsutum* is given.

Key words: IUCN Red List, Linaceae, *Linum*, section *Dasylinum*, Turkey.

The genus *Linum* L. (Linaceae) comprises about 180 species in the temperate regions of the world (Mabberley, 1997). The Mediterranean area is one of the main centers of diversity for *Linum*, with approximately 75 species (Greuter et al., 1989); this diversity is particularly pronounced in the Balkans and Anatolia (Davis, 1967a).

The genus *Linum* has been divided into five sections; of these, section *Dasylinum* (Planch.) Juz. is distributed in central and southern Europe, the Caucasus, and western Asia (Davis, 1957; Ockendon & Walters, 1968; Agnew, 1980; Zohary, 1987). This section is one of the more easily recognizable groups within *Linum* and is distinguished by its characteristic indumentum on the entire plant consisting of hirsute or villous, unicellular trichomes. Section *Dasylinum* comprises about seven species; they are usually perennial herbs (e.g., *L. viscosum* L., *L. hirsutum* L., *L. unguiculatum* P. H. Davis, *L. densiflorum* P. H. Davis, *L. hypericifolium* Salisb., *L. olympicum* Boiss.) or conspicuous annuals (e.g., *L. pubescens* Banks & Sol., *L. seljukorum* P. H. Davis) (Davis, 1967a; Yılmaz & Kaynak, 2008a, b). This section was first established by Planchon (1847) as a series within the subgenus *Syllinum* (Griesb.) Planch. Juzepzhuk (1949) subsequently evaluated this group as a separate section within *Linum*. In this paper, we describe a new subspecies for *L. hirsutum* within section *Dasylinum* from southwestern Anatolia, Turkey.

Flowering specimens of *Linum hirsutum* were collected from Bozdağ Mountain, from Tavas, Denizli Province, Turkey, in June 2007 and 2008. Available herbarium specimens of *L. hirsutum* were examined from the herbaria ANK, BULU, EGE, GAZI, and K, including the type specimens. For scanning electron microscopy, selected representative materials were coated with gold-palladium for two minutes in a BAL-TEC SCD 005 sputter-coater (Leica Microsystems, Wetzlar, Germany). The micrographs were obtained using an EVO 40 microscope (Carl Zeiss AG, Oberkochen, Germany) at 30 kV.

1. Linum hirsutum L., Sp. Pl. 1: 277. 1753. TYPE: "Habitat in Austriae, Tatariae edits graminosis," *Gerber s.n.* (lectotype, designated in Optasyuk & Mosyakin [2006: 525], LINN 396.11 digital image seen).

1a. Linum hirsutum subsp. **hirsutum**.

1b. Linum hirsutum subsp. **anatolicum** (Boiss.) Hayek, Prodr. Fl. Balc. 1: 564. 1925. Basionym: *Linum anatolicum* Boiss., Diagn. Pl. Orient., ser. 1, 1: 56. 1843. TYPE: Turkey. Laodicea, 1842, *Boissier s.n.* (type, K digital image seen).

1c. Linum hirsutum subsp. **bozdaghense** Yılmaz & Kaynak, subsp. nov. TYPE: Turkey. C2 Denizli: Tavas, Büyükkonak (Nikfer), N of Bozdağ Mtn., 1946 m, 37°19′N, 29°10′E, 13 June 2007, *Ö. Yılmaz s.n.* (holotype, BULU 29039). Figure 1.

Haec species *Lino hirsuto* L. subsp. *oreocarico* P. H. Davis similis, sed ab eo foliis oblanceolata-oblongis 4–6 × 0.5–1.5 mm (non 6–9 × 1.5–2 mm) margine haud glandulosis atque petalis pallide azureis ad basim flavis differt.

Herbaceous perennials, arising from an underground woody stock; nonflowering shoots few, flowering stems prostrate, to 10 cm vertically, ca. 0.5 mm thick, pilose. Lower cauline leaves and nonflowering shoot leaves oblanceolate, 2–3 × ca. 0.5 mm, obtuse, glabrous. Median cauline leaves oblanceolate-oblong, attenuate near base, 4–6 × 0.5–1.5 mm, 1-veined, blade without glandular margins, glabrous to sparsely pilose, subacute to obtuse. Flowers 1 to 5 per fertile stem, pedicels 1–2 mm, flowers heterostylic. Sepals lanceolate, 6.5–8.5 × 1.5–2 mm, the outer sepals with

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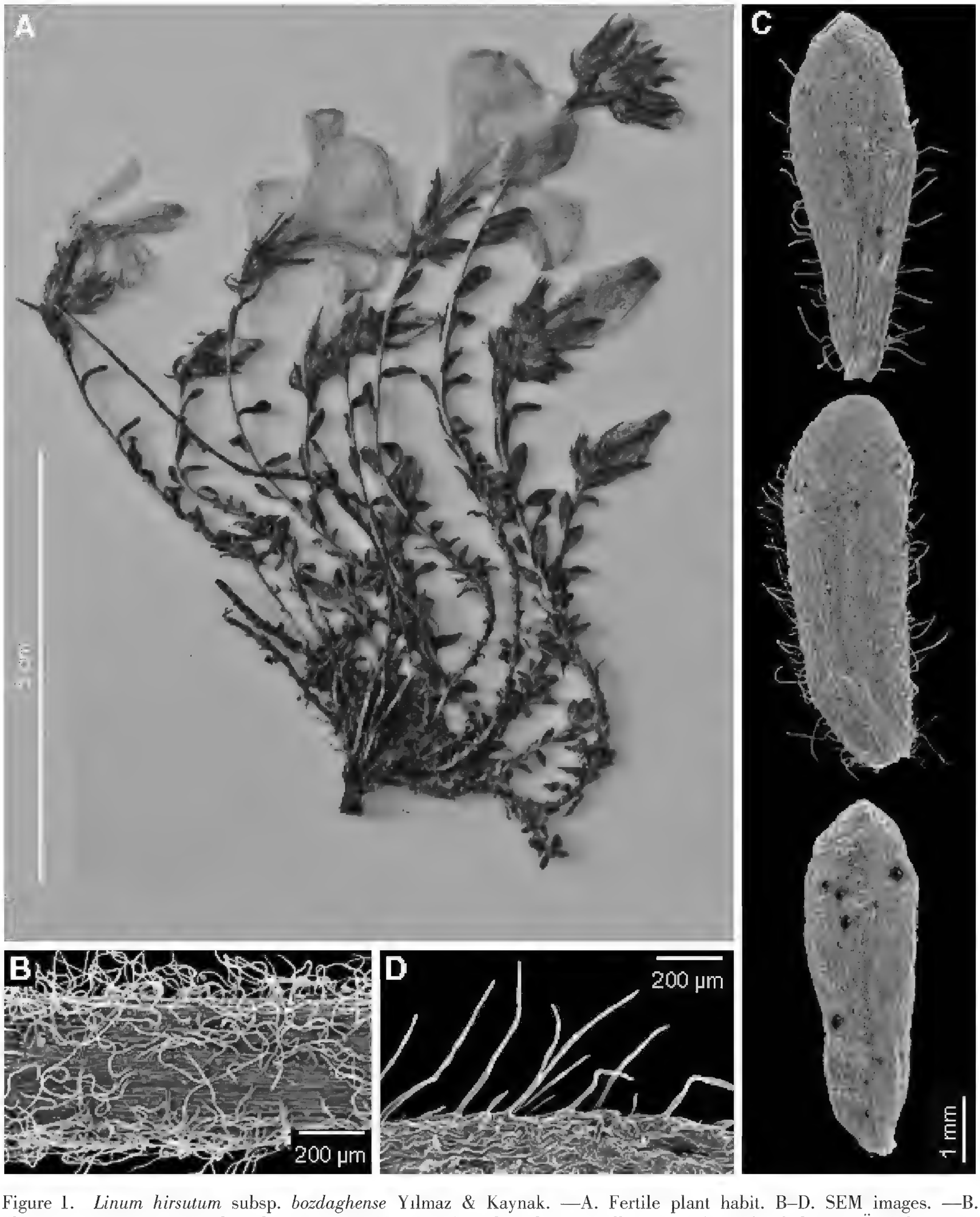

Figure 1. *Linum hirsutum* subsp. *bozdaghense* Yılmaz & Kaynak. —A. Fertile plant habit. B–D. SEM images. —B. Flowering stem. —C. Cauline leaves. —D. Margin of cauline leaves. All images from the holotype *Ö. Yılmaz s.n.* (BULU 29039).

stalked glands at margins, the inner sepals with scarious margins at base, conspicuously 3-veined, not keeled, densely pilose; petals 17–22 × 7–8 mm, pale blue with yellow base. Capsule unknown.

Distribution and habitat. *Linum hirsutum* subsp. *bozdaghense* and *L. hirsutum* subsp. *oreocaricum* are isolated taxa and of local distributions (Fig. 2). The two subspecies were only found on Bozdağ and Babadağ Mountains, respectively. Both of them grow on calcareous alpine steppes, at altitudes approximately 1900 m above sea level. *Linum hirsutum* subsp. *byzantinum* Azn. is restricted to the European part of Turkey, while *L. hirsutum* subsp. *anatolicum*,

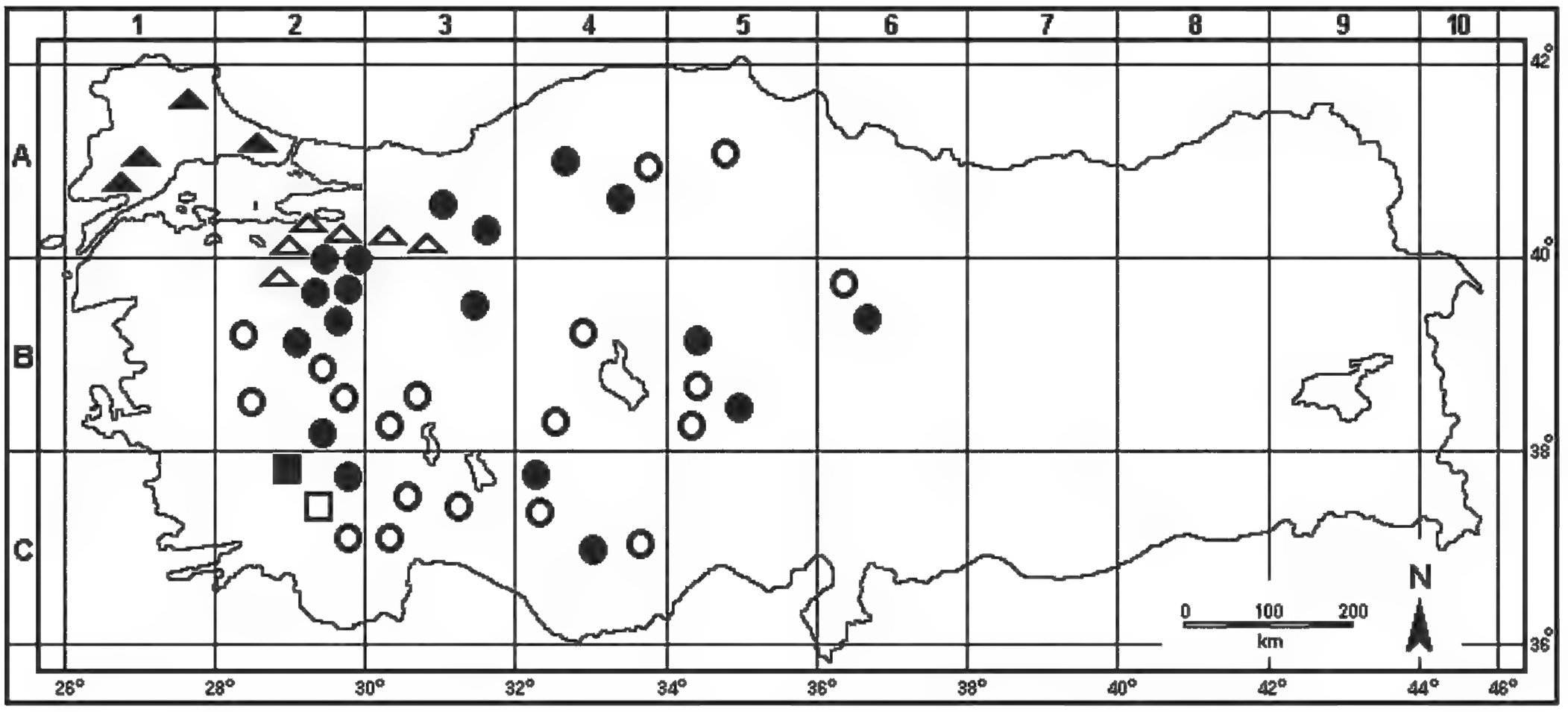

Figure 2. Distributions for subspecies of *Linum hirsutum* L. in Turkey. Filled circle, *L. hirsutum* subsp. *anatolicum*; open square, *L. hirsutum* subsp. *bozdaghense*; filled triangle, *L. hirsutum* subsp. *byzantinum*; filled square, *L. hirsutum* subsp. *oreocaricum*; open triangle, *L. hirsutum* subsp. *platyphyllum*; open circle, *L. hirsutum* subsp. *pseudoanatolicum*.

L. hirsutum subsp. *platyphyllum* (P. H. Davis) Yılmaz & Kaynak, and *L. hirsutum* subsp. *pseudoanatolicum* P. H. Davis are distributed in western and central Anatolia. They grow mostly under trees and in forest clearings of *Pinus brutia* Ten. and *P. nigra* J. F. Arnold, fallow fields, rocky places, and calcareous steppes between 200 and 1500 m.

IUCN Red List category. *Linum hirsutum* subsp. *bozdaghense* is endemic to southwestern Anatolia and is known from two close localities. The populations consist of approximately 150 individuals. Therefore, the new subspecies is assessed here as Critically Endangered (CR B2) according to IUCN Red List criteria (IUCN, 2001), because the estimated area of occupancy is less than 10 km^2.

Phenology. The new subspecies was collected in flower in June.

Etymology. The epithet of the new subspecies refers to the type locality.

Discussion. *Linum hirsutum* is a highly polymorphic species represented by many subspecific taxa in Europe and Anatolia (Davis, 1957; Ockendon & Walters, 1968). In Turkey, the taxon is represented by five subspecies (Yılmaz & Kaynak, 2006). All of them, with the exception of *L. hirsutum* subsp. *byzantinum*, are endemic to Anatolia. The stem orientation (erect, ascending, prostrate), leaf shape, presence or absence of glands at the margins of median cauline leaves, the number of flowers per inflorescence, and flower color are used to distinguish the subspecific taxa within *L. hirsutum* (Davis, 1967a, b).

Linum hirsutum subsp. *bozdaghense* is similar to *L. hirsutum* subsp. *oreocaricum*. However, the new subspecies clearly differs by its median cauline leaves that are oblanceolate-oblong (vs. oblong), smaller (4–6 × 0.5–1.5 mm vs. 6–9 × 1.5–2 mm), and with eglandular margins (vs. glandular margins); its flowers numbering one to five per stem (vs. one to three per fertile stem); and its petals that are pale blue with a yellow base (vs. white with a lilac base). The new subspecies is also morphologically close to *L. hirsutum* subsp. *anatolicum*, but subspecies *anatolicum* is distinct by its taller habit (20–50 cm) and ascending flowering stems, oblong-linear and larger median cauline leaves, seven or more flowers per fertile stem, and pale lilac to blue petals.

Paratype. TURKEY. **C2 Denizli:** Tavas, Büyükkonak (Nikfer), W of Bozdağ Mtn., 2100 m, 20 June 2008, *Ö. Yılmaz s.n.* (BULU 32550).

1d. Linum hirsutum subsp. **byzantinum** Azn., Bull. Soc. Bot. Fr. 46: 140. 1899. TYPE: [Turkey.] "Lieux incultes et secs des, collines, prés de Beuyuk–Halkale (Büyük Halkalı)," *Aznavour s.n.* (type, G).

1e. Linum hirsutum subsp. **oreocaricum** P. H. Davis, Notes Roy. Bot. Gard. Edinburgh 22: 143. 1957. TYPE: [Turkey.] C2 Denizli: Baba Da. above Kadiköy, 2300 m, on limestone scree, 19 June 1938, *Davis 233* (holotype, K; isotype, E digital image seen).

1f. Linum hirsutum subsp. **platyphyllum** (P. H. Davis) Yılmaz & Kaynak, Ann. Bot. Fenn. 43(1): 62. 2006. Basionym: *Linum hirsutum* L. subsp. *anatolicum* (Boiss.) Hayek var. *platyphyllum* P.

H. Davis, Notes Roy. Bot. Gard. Edinburgh 22(3): 142. 1957. TYPE: Turkey. Keschisch Da., 200 m, 1889, *Bornmüller 4216* (holotype, K digital image seen).

1g. Linum hirsutum subsp. **pseudoanatolicum** P. H. Davis, Notes Roy. Bot. Gard. Edinburgh 28: 38. 1967. TYPE: [Turkey.] Bakir Dagh, above Kisge, 1500 m, open slopes by *Pinus nigra* subsp. *pallasiana* forest, 28 June 1952, *Davis 19317, Dodds & Çetik* (holotype, E; isotype, K).

KEY TO THE SUBSPECIES OF *LINUM HIRSUTUM* L. IN TURKEY (MODIFIED FROM THE *FLORA OF TURKEY* [DAVIS, 1967A])

1a. Median cauline leaves with glands at margins.
  2a. Flowering stems of mature plants > 20 cm, ascending to erect.
    3a. Median cauline leaves oblong-linear, 6–14 × 2–5 mm . . . *L. hirsutum* subsp. *anatolicum*
    3b. Median cauline leaves oblong-spatulate, 14–27 × 5–12 mm . . . . . *L. hirsutum* subsp. *platyphyllum*
  2b. Flowering stems of mature plants up to 10 cm, prostrate. . . . . *L. hirsutum* subsp. *oreocaricum*
1b. Median cauline leaves without glands at margins.
  4a. Median cauline leaves > 8 mm long, flowers 7 to many.
    5a. Plant suffruticose, median cauline leaves oblong-spatulate, attenuate near base . . . . . *L. hirsutum* subsp. *byzantinum*
    5b. Plant herbaceous perennial, cauline leaves narrowly oblong to linear, not attenuate near base . . . . . *L. hirsutum* subsp. *pseudoanatolicum*
  4b. Median cauline leaves up to 6 mm long, flowers 1 to 5 . . . *L. hirsutum* subsp. *bozdaghense*

Specimens examined (the following specimens voucher the map points in Fig. 2).

Linum hirsutum L. subsp. *anatolicum* (Boiss.) Hayek: TURKEY. **A2 Bilecik:** Yenişehir–Bilecik, *Ö. Yılmaz s.n.* (BULU 19930). **Bursa:** Uludağ, Soğukpınar, *M. Başarman* 3793 (ISTF). **A3 Bolu:** Düzce–Bolu, *Ö. Yılmaz s.n.* (BULU 26933); Eskipazar–Gerede, *Ö. Yılmaz s.n.* (BULU 24274). **A4 Çankırı:** Şabanözü–Eldivan, *Ö. Yılmaz s.n.* (BULU 27012). **Karabük:** Safranbolu–Eflani, *Ö. Yılmaz s.n.* (BULU 26952). **B2 Bilecik:** Pazaryeri–Bilecik, *Ö. Yılmaz s.n.* (BULU 19948). **Bursa:** Denizler–Keles, *Ö. Yılmaz s.n.* (BULU 19926); Keles, *Ö. Yılmaz s.n.* (BULU 11491). **B2 Denizli:** Babadağ, *Ö. Yılmaz s.n.* (BULU 24176). **Kütahya:** Domaniç, *Ö. Yılmaz s.n.* (BULU 19917). **B3 Eskişehir:** Sivrihisar–Polatlı, *Ö. Yılmaz s.n.* (BULU 26890). **B5 Kırşehir:** Kırşehir, *Ö. Yılmaz s.n.* (BULU 24242B). **Nevşehir:** Uçhisar, *Ö. Yılmaz s.n.* (BULU 24233). **B6 Sivas:** Hafik–Zara, *Ö. Yılmaz s.n.* (BULU 26985). **C2 Denizli:** Laodicea, 1842, *Boissier s.n.* (type K, digital image seen). **C4 Karaman:** Kıraman–Büyükora, *Ö. Yılmaz s.n.* (BULU 24221). **Konya:** Beyşehir–Konya, *Ö. Yılmaz s.n.* (BULU 24184).

Linum hirsutum L. subsp. *byzantinum* Azn.: TURKEY. **A1 Çanakkale:** Korudağ, *Ö. Yılmaz s.n.* (BULU 24162). **Kırklareli:** Kıyıköy–Vize, *Ö. Yılmaz s.n.* (BULU 26922). **Tekirdağ:** Keşan–Malkara, *Ö. Yılmaz s.n.* (BULU 24171). **A2 (E) İstanbul:** Kemerburgaz–Çatalca, *Ö. Yılmaz s.n.* (BULU 26915).

Linum hirsutum L. subsp. *oreocaricum* P. H. Davis: TURKEY. **C2 Denizli:** Baba Da. above Kadiköy, *Davis 233* (holotype, K; isotype, E digital image seen).

Linum hirsutum L. subsp. *platyphyllum* (P. H. Davis) Yılmaz & Kaynak: TURKEY. **A2 Bilecik:** Bilecik–Bozöyük, *Ö. Yılmaz s.n.* (BULU 19946). **A2 Bursa:** Keschisch Da. (Ulu D.), *Bornmüller 4216* (holotype, K digital image seen). **Bursa:** Bursa–Keles, *Ö. Yılmaz s.n.* (BULU 11472). **A3 Adapazarı:** Taraklı–Geyve, *Ö. Yılmaz s.n.* (BULU 27018). **Bilecik:** Bozöyük–Bilecik, *Ö. Yılmaz s.n.* (BULU 26895). **B2 Kütahya:** Tavşanlı–Emet, *Ö. Yılmaz s.n.* (BULU 19952).

Linum hirsutum subsp. *pseudoanatolicum* P. H. Davis: TURKEY. **A4 Kastamonu:** Araç–İğdir, *Ö. Yılmaz s.n.* (BULU 24270). **A5 Çorum:** Havza–Merzifon, *Coode-Jones 1955* (ISTO). **B2 Balıkesir:** Simav–Demirci, *Ö. Yılmaz s.n.* (BULU 28989). **Denizli:** Kaplanlar–Çal, *Ö. Yılmaz s.n.* (BULU 28998). **Kütahya:** Domaniç, *Ö. Yılmaz s.n.* (BULU 11946). **B2 Afyon:** Bölme–Ulubey, *Ö. Yılmaz s.n.* (BULU 26887). **B3 Afyon:** Sandıklı, *Ö. Yılmaz s.n.* (BULU 19973). **Isparta:** Keçiborlu–Özbahçe, *Ö. Yılmaz s.n.* (BULU 19972). **B4 Ankara:** Ankara'nın 68 km güneyi, *H. Birand 2003, M. Zohary* (ANK). **Konya:** Ilgın–Kadınhanı, *Ö. Yılmaz s.n.* (BULU 24203). **B5 Aksaray:** Aksaray–Nevşehir, *Ö. Yılmaz s.n.* (BULU 24228). **Kırşehir:** Kırşehir–Mucur, *Ö. Yılmaz s.n.* (BULU 24245). **B6 Sivas:** Tokat–Sivas, *Ö. Yılmaz s.n.* (BULU 26980). **C2 Denizli:** Çardak–Çatlı, *Ö. Yılmaz s.n.* (BULU 28991). **C3 Antalya:** Korkuteli–Çavdır, *Ö. Yılmaz s.n.* (BULU 19967). **Isparta:** Gönen–Güneykent, *Ö. Yılmaz s.n.* (BULU 19970). **Konya:** Seydişehir–Beyşehir, *Ö. Yılmaz s.n.* (BULU 24180). **C4 Karaman:** Mut–Karaman, *Ö. Yılmaz s.n.* (BULU 13983). **Konya:** Ladik, *H. Birand 136* (ANK).

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A New Species of *Pedicularis* (Orobanchaceae) from the Hengduan Mountains, Southwestern China

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ABSTRACT. *Pedicularis obliquigaleata* W. B. Yu & H. Wang (Orobanchaceae) is described and illustrated from the Hengduan Mountains, in Yunnan Province, southwestern China. This new species was found in alpine meadows and along the edge of *Abies* Mill. forest. The new taxon is placed in *Pedicularis* ser. *Dissectae* H. L. Li and is similar to *P. souliei* Franch. from Sichuan Province. *Pedicularis obliquigaleata* differs by having densely gray pubescent stems; a pinnatipartite leaf with segments that are triangular-ovate to oblong-ovate with dentate margins; and flowers with two calyx lobes, a bent galea, semicircular beak, and a purple or rose-red corolla lower lip with a subtruncate middle lobe. Pollen and seed coat surface micromorphology of *P. obliquigaleata* were examined by scanning electron microscopy, and the chromosome number and karyotype were determined as $2n = 16 = 2m + 12sm + 2st$.

Key words: China, Hengduan Mountains, IUCN Red List, Orobanchaceae, *Pedicularis*.

The genus *Pedicularis* L. (Orobanchaceae) comprises more than 600 to 800 species distributed primarily in the Arctic and alpine regions of the Northern Hemisphere (Li, 1951; Yang et al., 1998; Mill, 2001; Wu et al., 2003; Wang et al., 2009). More than 368 species occur in China (Yang et al., 1998; Zhang et al., 2006). About two thirds of these species are confined to the region of the Hengduan Mountains in southwestern China (Yang et al., 1998; Ree, 2005; Yu et al., 2008), which represents one of the main centers of species diversity and endemism for this genus (Ree, 2005; Yu et al., 2008).

Floral diversification in *Pedicularis* is remarkable among flowering plants. Species from the Hengduan Mountains region span a rich diversity of floral types in this genus (Yang et al., 2003; Yu & Wang, 2008; Wang et al., 2009). Floral characters in *Pedicularis* have a high degree of homoplasy, and morphologically similar corollas have apparently been derived independently multiple times (Ree, 2005).

Between the summers of 2006 and 2007, we conducted extensive field investigations on the genus *Pedicularis* in the Hengduan Mountains region. The type of the new species was collected from Daxue Mountain (in the Shangri-La area), which is located along the border between Shangri-La County in northwestern Yunnan and Xiangcheng County in southwestern Sichuan. After careful examination of related herbarium specimens, *P. obliquigaleata* is identified here as a new species.

Flowers of the new species were observed directly in the field and rehydrated before measurements were taken and illustrations were prepared. For morphological descriptions, all materials were studied using a microscope (Olympus TGHM, Olympus Corp., Tokyo, Japan). Pollen and seed coat surface micromorphology were examined using a KYKY-10000B scanning electron microscope (Science Instrument Company, Beijing, China). For cytological study, we followed the methodology of Cai et al. (2004).

Pedicularis obliquigaleata W. B. Yu & H. Wang, sp. nov. TYPE: China. Yunnan: Shangri-La Co., Daxue Mtn., 28°33.518′N, 99°50.947′E, ca. 4294 m, 25 July 2007, *Wen-bin Yu 643* (holotype, KUN 0888324; isotypes, KUN, MO). Figures 1, 2.

Haec species *Pedicularidi souliei* Franch. maxime affinis, sed ab ea caule simplici cano-pubescente, foliis pinnatipartitis (nec pinnatisectis) segmentis ovato-deltoideis usque ovato-oblongis, dentatis (nec ovato-lanceolatis, pinnatifidis usque pinnatipartitis), dentibus calycis 2 (nec 5), galea

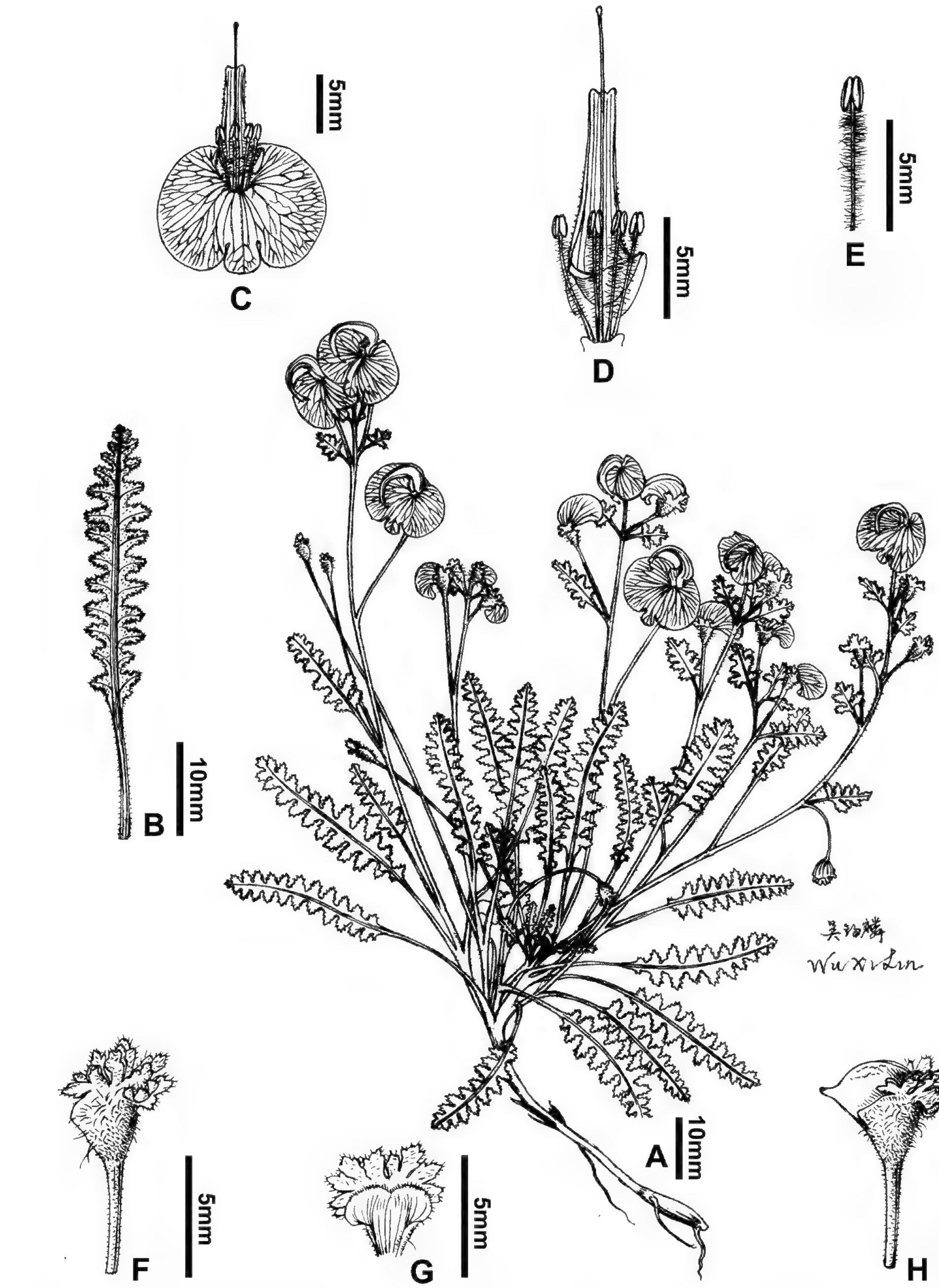

Figure 1. *Pedicularis obliquigaleata* W. B. Yu & H. Wang. —A. Habit. —B. Leaf. —C. Corolla lower lip. —D. Open beak showing stamens and style. —E. Anther and upper part of filament. —F. Calyx and pedicel, lateral view. —G. Open calyx. —H. Capsule. Drawn by Xi-Lin Wu from the holotype, *Wen-bin Yu 643* (KUN).

helicte obliqua (nec torsiva), rostro semicirculari (nec sigmoidei) atque labii inferioris lobo mediano subtruncto (nec ovato) differt.

Perennial herb, 9–15 cm tall, drying slightly black; taproots slender, long-conical, fusiform, ± fleshy; stems caespitose, mostly 5 to 9, unbranched and erect or ± ascending, densely gray pubescent. Basal leaves few or withering early; leaves with the petiole 1.5–3 cm, narrowly winged, pubescent; blades lanceolate-oblong to ovate-oblong, 2.5–4.3 × 0.8–1.2 cm,

Figure 2. *Pedicularis obliquigaleata* W. B. Yu & H. Wang. —A. Habit. —B. Inflorescence. —C. Close-up of two flowers. —D. Pollination of *P. obliquigaleata* flower by a bumblebee. Photographed at the type locality on Daxue Mountain by Wen-Bin Yu. Scale bars: A = 5 cm; B–D = 1 cm.

abaxially and adaxially completely pubescent, abaxially ± furfuraceous, pinnatipartite; leaf segments in 7 to 14 pairs, triangular-ovate to oblong-ovate, 0.4–0.9 × 0.2–0.5 cm, margin dentate, sparsely long-pubescent. Cauline leaves often pseudo-opposite, alternate apically, similar to basal ones, but smaller with a shorter petiole, 1–2.5 cm. Inflorescences racemose, 3–12 cm, centrifugal; bracts leaflike; flowers alternate

and axillary; basal pedicels 4–5.5 cm, apically only 0.5–1 cm, finely pubescent. Calyx tube 3.9–4.6 mm, the cleft nearly 1/2 anteriorly, densely pubescent; calyx lobes 2, leaflike, with 4 or 5 cleft divisions, incised-dentate; corolla purple or rose-red, white at throat; corolla tube erect, 4.9–7.1 mm; corolla galea bent obliquely to the left at a right angle apically (in front view); corolla beak 1–1.2 cm, semicircular; corolla lower lip 12.1–14.1 × 16.3–19.3 mm, ciliate, the middle lobe obviously smaller, subtruncate, 2.2–3.2 mm wide; anther filaments 4, pubescent. Capsule semiglobose, laterally mucronate, 0.5–0.8 × 0.6–1 cm; seeds 2.9–4.6 × 1.8–2.6 mm, nearly ellipsoid, but irregularly, ivory to white or beige; seed hilum indistinct, ventrally located.

Pollen and seed morphology. Pollen grains are radially symmetrical and isopolar (Fig. 3A), medium in size (polar length [P]: 23.23 ± 1.53 μm × equatorial diameter [E]: 24.47 ± 1.70 μm), and spheroidal to prolate (P:E = 1–1.46) in shape. The pollen aperture is bisyncolpate, and the colpi are usually wide, with the colpus membrane covered with granular elements (Fig. 3A); the exine ornamentation is microscabrate (Fig. 3B). The seed coat surface is covered with irregular reticulate sculpturing, i.e., quadrilateral or pentagonal meshes (Fig. 3C). The transverse ridges of the reticulum are widened and nearly smooth, and the longitudinal ones are narrow or inconspicuous (Fig. 3D). The cells formed by the reticulum are filled with alveolate meshwork (Fig. 3E).

Cytology. The somatic chromosome number is $2n = 16$, as counted from metaphasic chromatids from meiotic cells of the root tip (Fig. 3F). The karyotype formula is 2m + 12sm + 2st, representing two metacentric chromatids (the seventh pair in Fig. 3G), 12 submetacentric, and two subtelocentric chromatids (the eighth pair in Fig. 3G).

Distribution and ecology. *Pedicularis obliquigaleata* is endemic to the Hengduan Mountains in northwestern Yunnan and southwestern Sichuan provinces (Fig. 4). In addition to the type locality of Daxue Mountain, individuals of the new taxon were also collected from Wengtula Mountain of Daocheng County in southwestern Sichuan. *Pedicularis obliquigaleata* occurs in alpine meadows or along the edge of *Abies* Mill. forest from 3900 to 4500 m in elevation. At least 11 species were recorded as sympatric with *P. obliquigaleata*, i.e., *P. brachycrania* H. L. Li, *P. confertiflora* Prain, *P. confertiflora* subsp. *parvifolia* (Hand.-Mazz.) P. C. Tsoong, *P. cyathophylla* Franch., *P. cymbalaria* Bonati, *P. densispica* Franch. ex Maxim., *P. elwesii* Hook. f., *P. lutescens* Franch. ex Maxim., *P. rupicola* Franch. ex Maxim., *P. superba* Franch. ex Maxim., and *P. siphonantha* D. Don var. *stictochila* H. Wang & W. B. Yu.

IUCN Red List category. This new species has only been collected from the two sites mentioned above. However, it is common at these localities with populations of densely aggregated individuals (e.g., there are ca. 15 to 40 individuals per square meter at the type locality). According to IUCN Red List criteria (IUCN, 2001), *Pedicularis obliquigaleata* should be regarded as Least Concern (LC).

Phenology and pollination. The new species was found flowering from late June to August, and fruiting from mid July to October. Based on field observations, it appears to be exclusively pollinated by bumblebees (Fig. 2D).

Etymology. The specific epithet of the new species, *obliquigaleata*, refers to the oblique orientation of the corolla galea, which is bent to the left at a right angle as viewed apically from the front (Fig. 2C).

Relationships. According to the classification systems of Li (1949) and Tsoong (1963), *Pedicularis obliquigaleata* should be placed in series *Dissectae* H. L. Li. This series, separating from series *Oxycarpae* Prain, was established by Li (1949). Li (1949) proposed that series *Dissectae* differed from series *Oxycarpae* by having very long pedicels, axillary lower flowers that were scattered, and a short capsule. *Pedicularis obliquigaleata* is very similar to *P. souliei* Franch., also in series *Dissectae*, but it is distinguished from *P. souliei* (isotype, US, US image seen online) by having densely gray pubescent stems (vs. sparse indument in *P. souliei*), a pinnatipartite leaf with triangular-ovate to oblong-ovate leaf segments with dentate margins (vs. pinnatisect leaves with ovate-lanceolate to pinnatifid segments), two calyx lobes (vs. five), an obliquely bent galea (vs. twisted), a semicircular beak (vs. a sigmoid shape), and a corolla with a purple or rose-red lower lip and an apically subtruncate middle lobe (vs. pink or white, with an acute lobe apex) (see Table 1). In addition, *P. obliquigaleata* resembles *P. franchetiana* Maxim. and *P. mussotii* Franch. of series *Franchetianae* Prain by its basal flowers with longer pedicels, its pinnatipartite leaf, and its laterally mucronate and semiglobose fruit. Nevertheless, the racemose inflorescence, the shorter pedicels of the apical flowers, and the obliquely bent galea clearly distinguish *P. obliquigaleata* from these two species.

The key below serves to identify *Pedicularis obliquigaleata* and its related species. It includes all species belonging to series *Dissectae* and two species of series *Franchetianae* mentioned above.

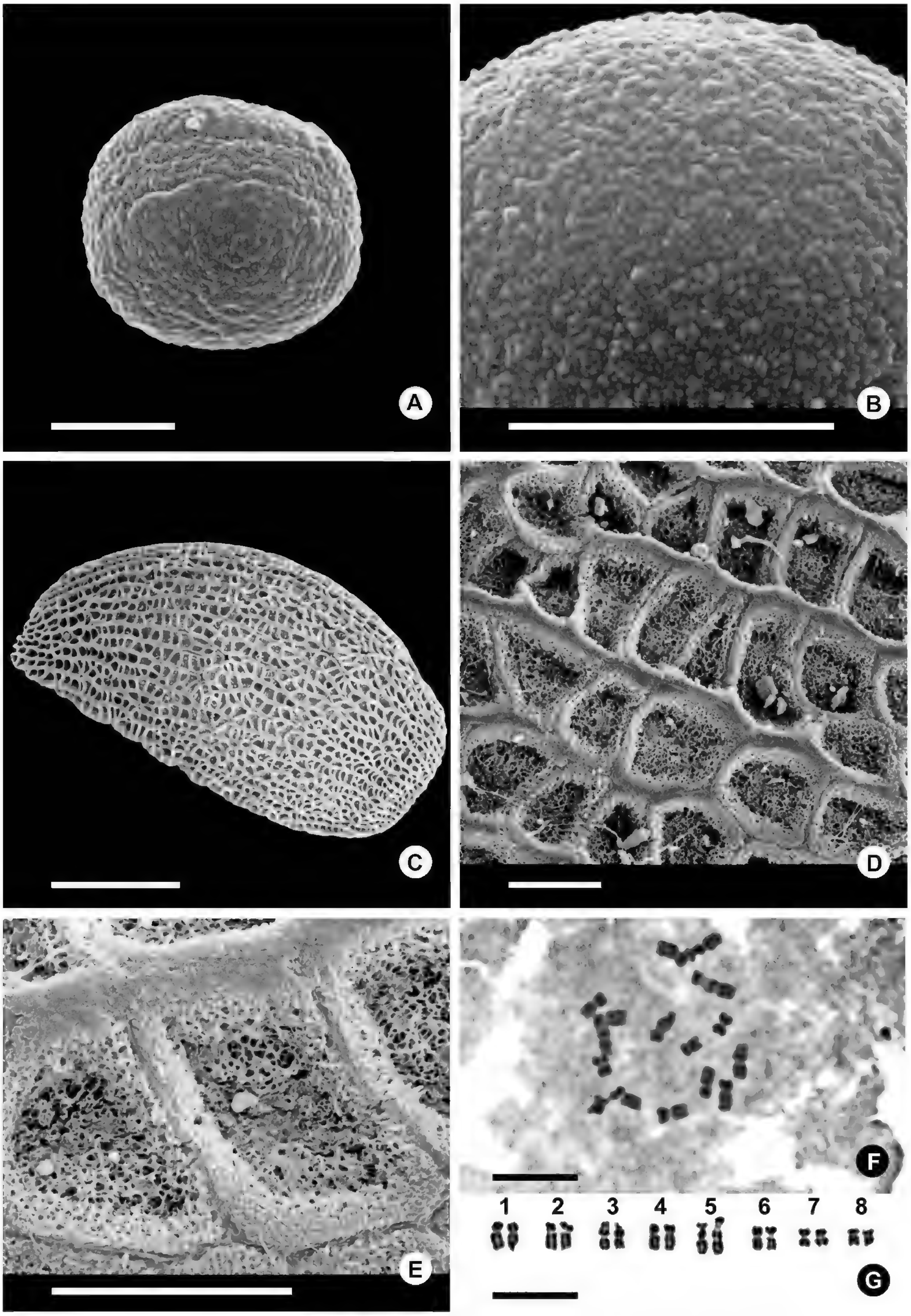

Figure 3. *Pedicularis obliquigaleata* W. B. Yu & H. Wang. A, B. SEM imaging of pollen morphology. —A. Pollen grain. —B. Detail of exine ornamentation. C–E. SEM imaging of seed morphology. —C. Entire seed, lateral view. —D, E. Seed coat surface. F, G. Karyological micrographs. —F. Metaphasic chromatids. —G. Karyogram. Scale bars: A, B, F, G = 10 μm; C = 1 mm; D, E = 100 μm.

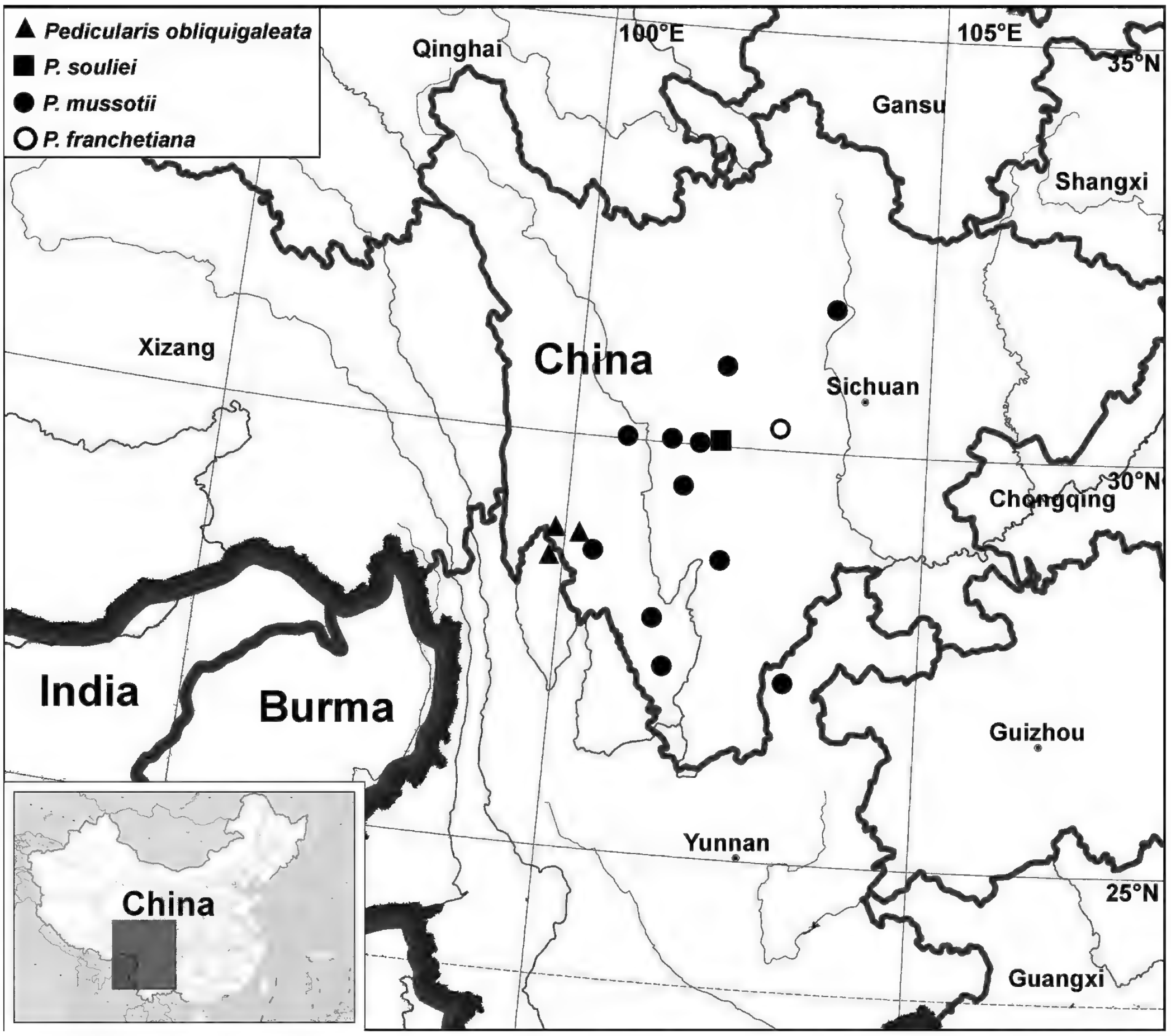

Figure 4. Distribution map of *Pedicularis obliquigaleata* and related taxa.

KEY TO SIMILAR SPECIES WITHIN *PEDICULARIS* SER. *DISSECTAE* AND *FRANCHETIANAE*

1a. Leaf pinnatipartite; inflorescence axillary; pedicel to 3–11.5 cm; galea erect; fruit semiglobose (series *Franchetianae*) 2

1b. Leaf pinnatipartite or pinnatisect; inflorescence racemose; pedicel < 5.5 cm; galea bent or twisted; fruit semiglobose or oblate-ovate (series *Dissectae*) . . . 3

2a. Stem branched; beak pendant and parallel to calyx, curved apically; middle lobes of lower lip equal to lateral ones; only 2 filaments pubescent . . . *P. franchetiana*

Table 1. Comparison of diagnostic characters between *Pedicularis obliquigaleata* and *P. souliei*.

Characters	*P. obliquigaleata*	*P. souliei*
Stems	unbranched, densely gray pubescent	unbranched, sparsely pubescent
Leaf	pinnatipartite	pinnatisect
Leaf segments	triangular-ovate to oblong-ovate, dentate	ovate-lanceolate, pinnatifid to pinnatipartite
Pedicel length, mm	5–55	5–40
Calyx tube length, mm	3.9–4.6	3–5
Calyx lobes	2; 4 or 5 cleft and incised-dentate	5, lateral one lanceolate and dentate
Corolla tube length, mm	4.9–7.1	6–7
Corolla galea (front view)	bent to left at a right angle apically	twisted
Corolla beak	semicircular	S-shaped
Corolla lower lip	purple or rose-red, ciliate, spreading, 12.1–14.1 × 16.3–19.3 mm	pink or white, ciliate, spreading, ca. 15 × 10–12 mm
Middle lobe of lower lip	smaller than lateral ones and apically subtruncate	smaller than lateral ones and apically ovate

2b. Stem unbranched; beak semicircular; middle lobes of lower lip smaller than lateral ones; 4 filaments pubescent . . . . . *P. mussotii*
3a. Stem branched only basally; fruit semiglobose 4
3b. Stem branched basally and above; fruit oblate-ovate . . . 5
4a. Stem densely gray pubescent; leaf pinnatipartite; segments triangular-ovate to oblong-ovate with dentate margins; calyx lobes 2; corolla purple or rose-red; galea bent to left; beak semicircular. . . . . *P. obliquigaleata*
4b. Stem sparsely gray pubescent; leaf pinnatisect; segments ovate-lanceolate to pinnatifid; calyx lobes 5; corolla pink or white; galea twisted; beak S-shaped . . . . . *P. souliei*
5a. Calyx lobes 3, equal, palmatipartite; corolla purple-red; galea with a 2-auriculate protuberance; pedicel to 1.4 cm . . . . . *P. honanensis* P. C. Tsoong
5b. Calyx lobes 3, unequal, posterior lobe linear and subentire, lateral pair palmatipartite; corolla yellow or whitish with purple-red galea; galea without a 2-auriculate protuberance; pedicel to 3 cm. 6
6a. Leaves sparsely hairy abaxially; segments 8 to 12 pairs, ca. 4–5 mm wide; calyx hairy externally . . . . . *P. petitmenginii* Bonati
6b. Leaves glabrous abaxially; segments 6 to 9 pairs, ca. 2–3 mm wide; calyx glabrous externally . . . . . *P. dissecta* (Bonati) Pennell & H. L. Li

Paratypes. CHINA. **Yunnan:** Shangri-La Co., Daxue Mtn., 4100–4200 m, 16 Aug. 2005, *Wen-bin Yu, Shu-dong Zhang & Ding Wu 042* (KUN). **Sichuan:** Xiangcheng Co., Daxue Mtn., 3900–4000 m, 3 Aug. 1981, *Qing-Zang Exp. 3700* (KUN, PE); Daocheng Co., Wengtula Mtn., 4000 m, 21 Aug. 1937, *T. T. Yü 12817* (KUN, PE).

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